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Symbols



CAUTION: To reduce the risk of an electric shock, do not remove the back cover of the instrument. To retain memory of the previously used power setting, 115, 215, 230, 245 VAC line power is supplied to the instrument while it is plugged into a hospital grade wall receptacle.

CAUTION: The Hyfrecator Plus 7-797-J is wired for 100VAC line power and does not include the memory feature. There is no VAC line power supplied to the instrument when the ON/OFF switch is in the OFF position.



CAUTION: Site is a source of high voltage.



CAUTION: Before using instrument, read operating manual. The green, green/yellow wire of the line, which is inside the unit, is connected to the transformer housing and patient return to reduce the hazard of electric shock. Grounding of the equipment is achieved by connecting the line to a three conductor grounded hospital grade wall receptacle.



Equipment is classified as Type BF: it has an internal electrical power source that provides an adequate degree of protection against electric shock, particularly in regard to the allowable leakage current and the reliability of the Protective Earth connection. The unit is also protected against the effects of the discharge of cardiac defibrillation.

Foreword

This easy-to-follow manual is designed to assist you in the servicing of the Birtcher Model 7-797 HYFRECTOR PLUS. For basic information on how to operate or care for your unit, please refer to the operating manual that was included with the unit at the time of purchase. If you have questions, or would like personal assistance regarding how to service the unit, please call Birtcher Medical Systems' Service Department at (714) 753-9400, (800) 888-1771

General Information

Birtcher Medical Systems introduced the first Hyfrecator in 1937 and has since become the world's leader in office-based electrosurgery. With the latest model, the HYFRECTOR PLUS 7-797, Birtcher Medical Systems has refined the concept and utilized today's technology to produce the finest machine of its kind.

Safe and simple to use, the HYFRECTOR PLUS has a wide range of applications – from dermatology and gynecology to ophthalmology and urology. The HYFRECTOR PLUS' sophisticated electronic circuitry provides a near linear power output. Whether it's full power for broad surface coagulation, or low output for delicate facial procedures, the HYFRECTOR PLUS provides the precision you demand. Compatible with existing Hyfrecator accessories, such as bipolar forceps and reusable electrodes, the HYFRECTOR PLUS features an ergonomic design and contemporary style that complements modern office decor.

Section 1 – Control Functions

Front, Side and Hand Switching Pencil Controls

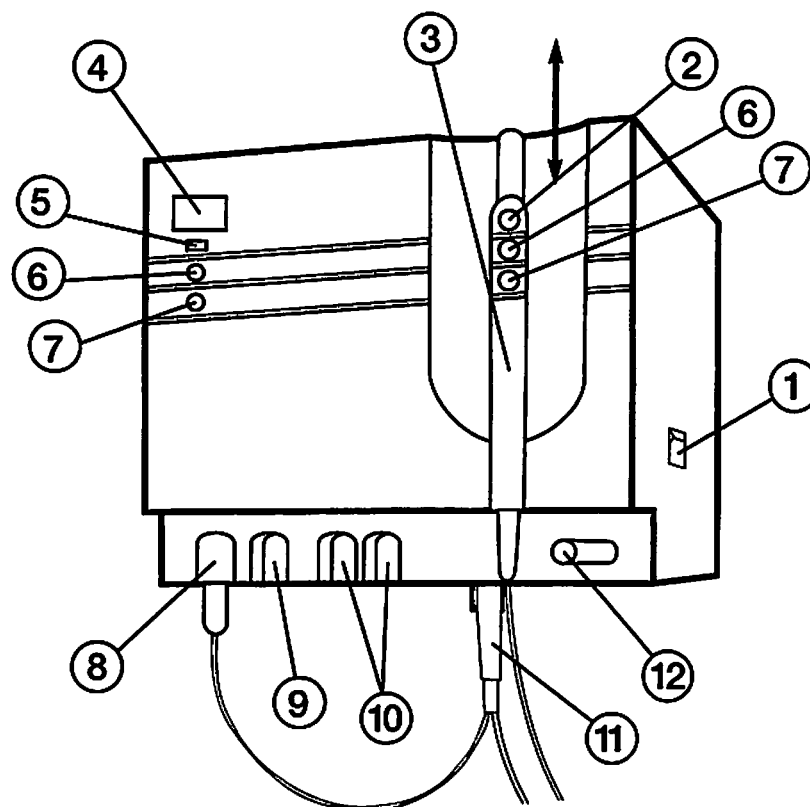


Figure 1
Front, Side and Hand Switching Pencil Controls

-
1. **ON/STANDBY OFF SWITCH***
Turns unit on or off. In the off mode, standby allows the unit to automatically "power up" to the setting last used.
 2. **POWER ACTIVATION BUTTON**
When pressed, high frequency energy is emitted from the electrode. Additionally, an audible tone is generated and the "active" indicator illuminates.
 3. **POWER UP/DOWN SWITCHING HANDLE and CORD****
Remove or insert the power handle in the indicated direction.
 4. **POWER OUTPUT INDICATOR**
Displays the actual power being delivered. Power selection ranges from zero to 30 watts in high and bipolar outputs and zero to 15 watts in low output. In the low output, deliveries less than five watts are displayed in two-tenth increments.
 5. **"ACTIVE" INDICATOR**
Illuminates when the power activation button is pressed.
 6. **POWER UP BUTTONS**
Increases power either incrementally or rapidly. Each "click" advances the power by one watt or by two-tenths of a watt when less than five watts in the low output. Holding the button down rapidly advances the indicated output.
 7. **POWER DOWN BUTTONS**
Decreases power either incrementally or rapidly. Each "click" decreases the power by one watt or by two-tenths of a watt when less than five watts in the low output. Holding down the button rapidly decreases the indicated output.
 8. **HIGH OUTPUT TERMINAL**
Insert the power up/down switching handle and cord single plug into this outlet for heavy desiccation and fulguration procedures requiring high intensity. Provides between zero and 30 watts with high voltage.
 9. **LOW OUTPUT TERMINAL**
Insert the power up/down switching handle and cord single plug into this outlet for light desiccation and fulguration procedures requiring low intensity. Provides between zero and 15 watts with a voltage lower than the high output terminal.
 10. **BIPOLAR OUTPUT TERMINAL**
For coagulation procedures using either a dispersive patient plate or forceps. When using the dispersive plate, the plate plugs into either bipolar outlet and the handle plugs into the remaining outlet. When using forceps, the forceps plug into both bipolar outlets (a footswitch is required when forceps are utilized). Bipolar provides between zero and 30 watts with a voltage lower than the high or low output terminals.
 11. **SWITCHING CONNECTOR**
The power up/down switching handle and cord socket plugs into this connector. Be sure to align the connector pins before inserting.

Note: The optional foot switch plugs into this same jack.
 12. **TERMINAL SELECTOR SWITCH**
Selects the desired output terminal. Output displayed will be the last setting used (0-15 watts in low power, 0-30 watts in high and bipolar).

*The 100V Hyfrecator Plus, 7-797-J, does not include the standby feature.

**The 240V Hyfrecator Plus 7-797-B, contains a non-switching handle and a footswitch.

III. MAINTENANCE & TROUBLE SHOOTING

The system block diagram and basic circuit schematic are provided here for general review of the basic circuits that make up the Surgitron® FFPF EMC™. They should be reviewed carefully before performing any troubleshooting. Troubleshooting flowcharts are supplied for the more common problems.

The power supply includes the entry module, thermal transformer, fuses and line switch. Four high-power diodes make up the full wave rectifier. The mode selector controls the output waveform rectifier and filter. There are three options from the mode selector:

1. Fully rectified and filtered
2. Fully rectified
3. Partially rectified

They are used to perform pure Cut, Cut and Coag, and Hemo, respectively.

The RF signal network generates a 3.8 MHz high frequency signal as a carrier. This is modulated by the lower frequency signal from the mode selector.

The output power supply controller controls the output impedance matching and, therefore, controls the power output. Power output vs. load impedance test curves are included for your reference, see Fig. 3. This power intensity curve is plotted with a 500 Ohm pure resistance load.

The antenna plate provides the return path for the RF signal. The system output is controlled by operating the footswitch.

The following fault conditions are defined, along with the check procedure and the specific conditions experienced. Step-by-step procedures necessary to isolate the fault are provided so that solutions are achieved.

- A. If red AC light does not light up:
 1. Check that the power cord is plugged into the wall outlet and the other end is correctly plugged into the receptacle unit.
 2. Check fuses; do not use larger than indicated – 1.6 amp/220V or 3.0 amp/117V. Using a larger fuse will damage the Surgitron unit. Replace fuse with P/N: R-EK03A (1.6 amp/220V) or R-EK03B (3.0 amp/117V), as specified in the Surgitron FFPF EMC Repair Kit.
 3. If fuse continues to blow, remove four screws from both sides of the unit and carefully remove cover. Check for the following conditions:
 - a. Transformer short circuit – replace P/N R-EK09 (RF Safety Thermo Transformer).
 - b. Check short circuit on diode PCB or replace P/N R-EK13.
 - c. Check short circuit on R1 or replace P/N R-EK15.
 - d. Check short circuit on R5 or replace P/N R-EK16.
 4. Check AC indicator bulb; if it is open-circuited, replace P/N R-EK05A (AC Light Diode). Check the voltage output of the power entry module. If there is no voltage, replace the power entry module, R-EK17.
 5. Check secondary output voltage from transformer:
 - a. Between green wires should be >6.3V.
 - b. Between red wires should be >600V.
 - c. If these conditions are not met, replace P/N R-EK09 (RF Safety Thermo Transformer).
 6. Visually inspect the unit for shorted or burnt resistors and capacitors. Inspect wire connections and solder joints.
 7. Tube may be defective; replace P/N R-EK10 (RF Amplifier Power Tube).

B. If RF indicator does not light when foot-switch is pressed:

- 1. Allow a 15 second warm-up period before activating the unit.**
- 2. Defective foot-switch; replace with P/N R-EK2 (EMC RF Foot Control).**
- 3. Turn on the unit and allow a 15 second warm-up period. Visually inspect tube filament. If it does not glow (and AC indicator light is on), replace with P/N R-EK10 (RF Amplifier Power Tube).**
- 4. Check RF light bulb. If it is open-circuited, replace with P/N R-EK14.**
- 5. Check ground system to see if green/yellow ground wire is connected. This wire must be attached to chassis ground.**
- 6. Check shorted or burnt components on R-EK16. If there is problem, replace R-EK16.**

Transformer Wiring

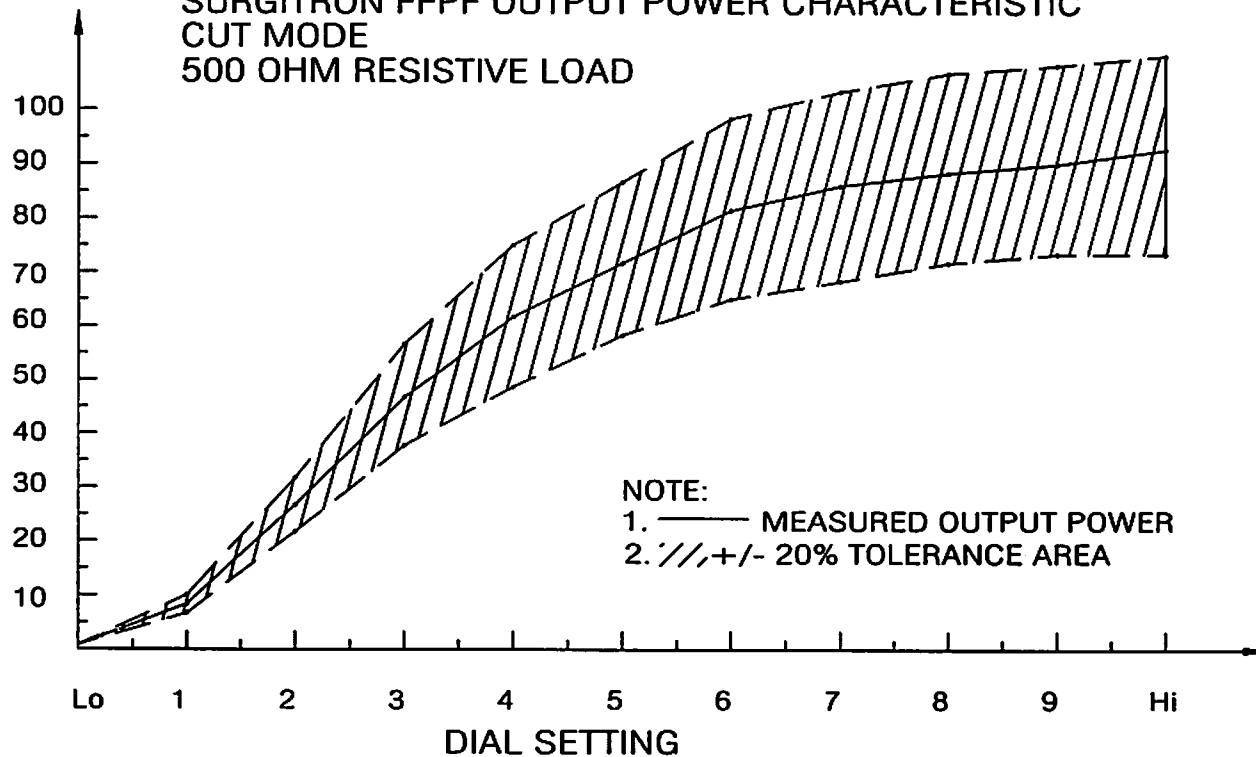
220 VAC - the Black and the White transformer primary wires should be used.

110/120 VAC - the Black and the Black/Red transformer primary wires should be used.

100 VAC - the Black and the Black/white transformer primary wires should be used.

ELLMAN PROPRIETARY

SURGITRON FFPF OUTPUT POWER CHARACTERISTIC
CUT MODE
500 OHM RESISTIVE LOAD



NOTE:

1. The data is obtained by using a 500 ohm resistive load.
2. Measurement Equipment:
 - a. Tektronics Probe P5100
 - b. MRS 500 Ohm Non-Ind Resistor
 - c. Tektronics DPO 4032
3. Output reference Power 140W peak is recorded on the Label.

QTY		ASSEMBLY NUMBER	ECN	REV.	B	REDRAWN	BY DATE	APVD
TOLERANCES UNLESS OTHERWISE SPECIFIED:				APPROVALS		DATE	REVISION	
INCHES		ANGULAR		DRAWN		DATE	E	
.X ± .02		±1°		F. Lin		06/14/95	ELLMAN INTERNATIONAL INCORPORATED 1120 Railroad Ave Huntington, NY 11827 (516) 838-6306	
.XX ± .01				D. Delatorre		10/03/03	Surgitron FFPF Output Power	
.XXX ± .005				REVIEWED		06/14/95		
FRACTIONAL - STOCK SIZE				SCALE		DWG NO	SHEET	REV.
DE-BURR ALL EDGES .020 MAX.				N/A		FFPF-0500-2	2 of 2	B

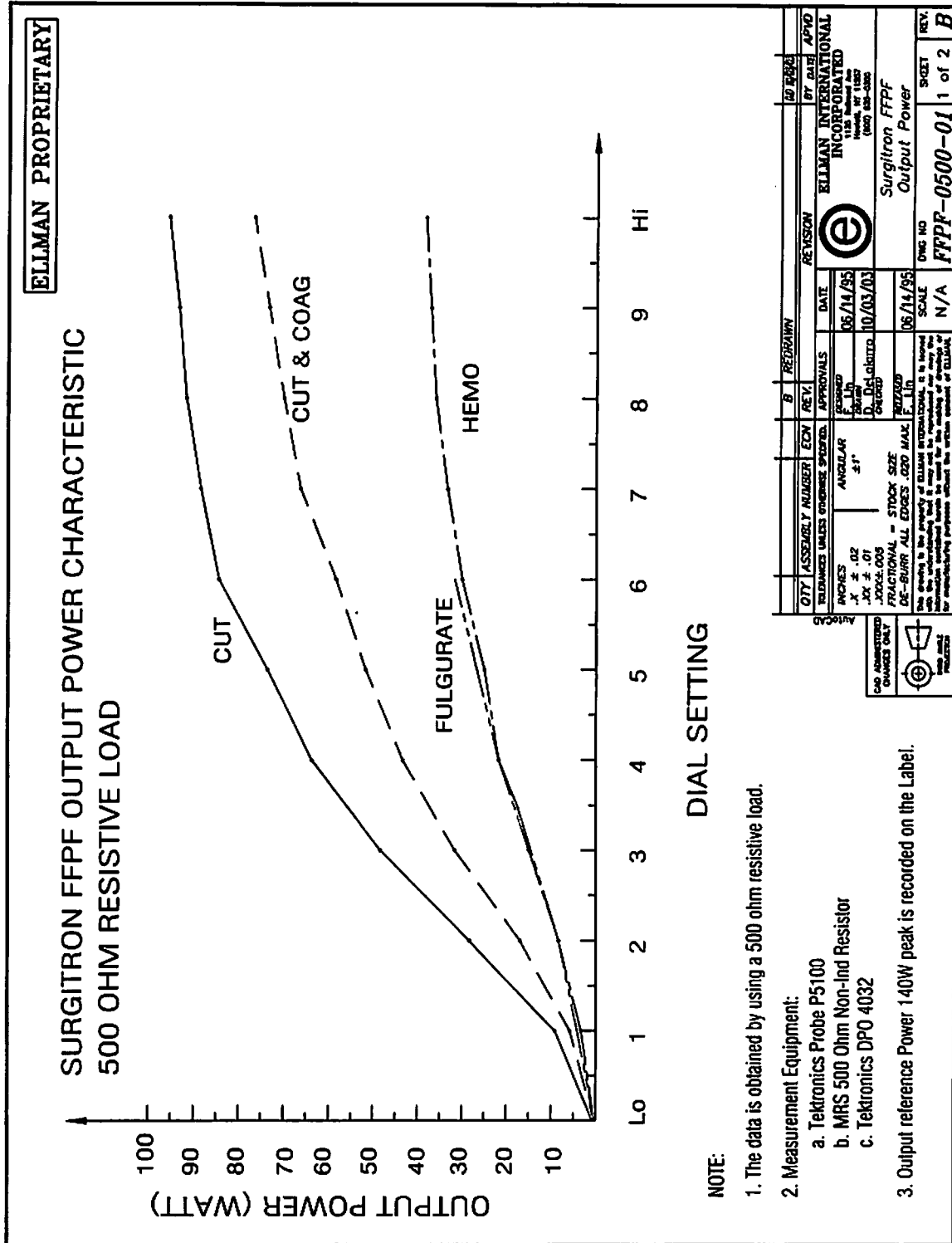
CAD ADMINISTERED
CHANGES ONLY

THIS ANGLE
PROJECTION

Autocad

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2.4 OUTPUT POWER CHARACTERISTIC



2. Hardware Inspection: (Visual Inspection)

a. Paint Finish Pass_____ Fail_____

b. Labeling Pass_____ Fail_____

Inspector: _____ Date: _____

2.3 SECOND DEGREE INSPECTION

This test is according to UL544 Standard.

Test equipment: HIPOT tester,

1. Dielectric Withstand Inspection: Pass_____ Fail_____

2. Ground Continuity Inspection: Pass_____ Fail_____

3. Work Bench Practical Test: Pass_____ Fail_____

20 Mins @ 10 sec.

On/ 30 sec. Off

Inspector: _____ Date: _____

II. QUALITY RECORD

ellman International, Inc.
3333 Royal Avenue, Oceanside, NY 11572 U.S.A
tel: (800) 835-5355, (516) 594-3333, fax: (516) 569-0054

2.1 GENERAL

a. Model: _____

b. Serial Number: _____

c. Power Supply Voltage: _____

d. Thermo Transformer Type: **MAGNET WOUND**

2.2 FIRST DEGREE INSPECTION Inspector: _____ Date: _____

(Refer to the 500 ohm load output power curve with 20% tolerance.)

Test equipment: Tektronics DPO 4032, Tektronics Probe P5100, 500 ohm Non-Inductive Load, DMM.

1. Operating Modes Inspection (Waveform inspection) and Primary Output Inspection

a. CUT: _____ (Check waveform with oscilloscope: Pure Filtered Wave)

Dial #	1	2	3	4	5	6	7	8	9	Hi
Power										

b. CUT COAG: _____ (Check waveform with oscilloscope: Fully Rectified)

Dial #	1	2	3	4	5	6	7	8	9	Hi
Power										

c. COAG: _____ (Check waveform with oscilloscope: Partially Rectified)

Dial #	1	2	3	4	5	6	7	8	9	Hi
Power										

d. FULGURATE: _____ (Only an oscilloscope is to be used for this measurement: Spark-Gap)

Dial #	1	2	3	4	5	6
Power						

ROOM TEMP: ____°F

ROOM HUMIDITY: ____%

Rear Panel Controls

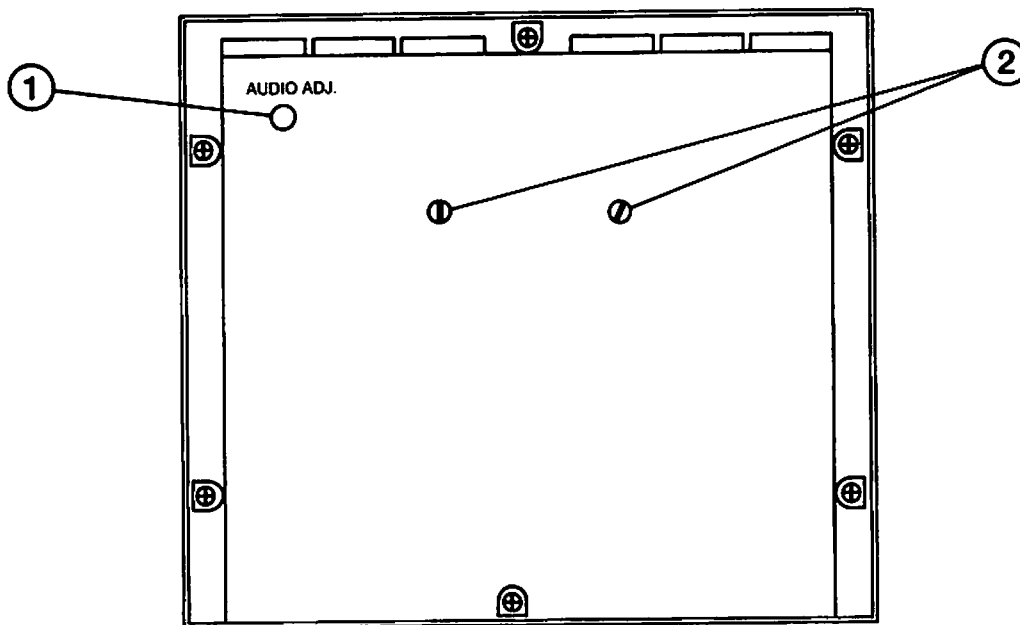


Figure 1a
Rear Panel Controls

1. **VOLUME CONTROL**

Adjusts volume of the audible tone generated when the power activation button is pressed. To increase volume, insert a screwdriver and rotate clockwise until resistance is felt. Do not force adjustment past the resistance point. For safety reasons, the tone cannot be completely turned off.

2. **WALL MOUNTING STUDS**

Used with standard wall mounting kit (see the kit for instructions). Instrument may also be mounted on the optional mobile pedestal stand (product number 7-796-1).

Section 2 – Theory Of Operation

All of the circuitry for the Birtcher Hyfrecator Plus is contained on two printed circuit boards. Board number 30-0164 contains microcontroller U56, DAC U57, 7-segment LED Display Decoder/Driver U59, 8 Bit Latch U58, DC Amplifier U52 and U53, 2MHz Amplifier U60 and gates U54 and U55. Board number 30-0165 contains the SCR Q1 and Photo-Triac A1 unregulated 55 DC volts, 15 DC Volts Regulator VR1, 5 DC Volts Regulator VR2, minus 5 DC Volts Regulator VR3, Dual D Flip-Flop U1, Comparator U2, Drivers Q3, Q4 and Q5, Power Fets Q6, Q7 and the control circuit.

Circuit Function

The microcontroller U56 with its built in oscillator controls all the timing for the Hyfrecator. The 2MHz frequency via amplifier U60 drives the counter producing 31,250 pulses per second at TP57, enabling U2 to turn on and off. Drivers Q3, Q4 and Q5 are turned on and off for a period of 0.2-6 micro seconds, which is determined by the Up/Down switches on the front panel or on the Switching Handle.

During the "ON" time, the drain of Q3 and Q5 are high, and Q4, Q6 and Q7 are switched on. Current through the output transformer primary increases linearly by $I = ET/L$. When Q6 and Q7 are switched off, the energy in T2 primary resonates with C21 producing a damped sine wave in the secondaries.

Section 3 – Circuit Description

Power Supply

CAUTION: The 115, 215, 230, or 245 volt AC mains is never turned off in this instrument. The power switch is in the low voltage power supply. A constant 5 volts is supplied to U56 to retain memory. (Units wired for 100 volts AC mains do not have memory, the power switch controls the 100 VAC mains.)

The power supply delivers three regulated voltages, -5, +5 and +15, and one unregulated high voltage, 55, at TP5. These voltages are generated from two secondary windings on transformer T1. Full wave bridges BR1 and BR2 supply the plus voltages. Doubler diodes CR1 and CR2 supply the voltage for the -5 volts.

Microcontroller

Eprom-Based 8-bit Microcontroller, U56, with its built in oscillator controls the base frequency for timing. The oscillator with its ceramic resonator Y51 operates at 2MHz.

The microcontroller U56 has two controlled set levels. These levels can be referred to as the 15 watt low output and the 30 watt high or bipolar output. The last setting of these two levels is independently remembered and controlled by the microcontroller. When I/O port pin 18 is held low, the microcontroller counts Up. When I/O port pin 17 is held low the microcontroller counts Down.

In the 15 watt low terminal, the scale changes in increments of .2 from 0-5 and in increments of 1 from 5-15. In the 30 watt high or bipolar terminal, the scale changes in increments of 1 from 0-30.

The microcontroller U56 generates the two levels, data, clock and strobe signals necessary to operate a 8 stage shift/store register U58 and a 7-segment decoder driver U59.

One I/O port pin 2 held low disables all input I/O ports during activation of the output power.

Reference Voltage

The reference voltage is a digital signal from the microcontroller U56 driving U58 8-stage shift register. The digital signal drives U57 Digital Analog Converter and U53 amplifier to generate the DC reference voltage of 2.50 for full scale. The voltage is controlled by the switches at the I/O ports Up/Down of the microcontroller.

LED Display

The two seven segment light-emitting displays are driven digitally from the data U59, 7-segment decoder driver.

Control Circuit

When pin 3 of J2 is at ground, or a low, current flows through R6, photo triac diode A1, illuminating LED DS51. This turns on the photo triac A1 turning on Q1, supplying the high voltage. A low at U51 12-bit binary counter enables the device, and pulses are generated for sound and the repetition rate. The repetition rate pulses of 31,250Hz trigger U1 D Flip-Flop to generate a positive pulse at pin 12 and a negative pulse at pin 13 approximately 1.75 microseconds in width.

A low at U54 pins 8 and 9 produces a low at U54 pin 10 and U56 microcontroller pin 2. This low disables the microcontroller U56 for the period the unit is delivering power and 30 milliseconds after U51 binary counter is reset.

A low at U55 pin 2 gates a 2000 Hz signal for the audio tone.

If pin 3 of J2 is low and a up or down switch is activated, U55 pins 12 and 13 will gate a 1000 Hz audio tone superimposed on the 2000 Hz. This represents a different tone than the activation switch for power output.

Comparator

The pulse width to control output power is generated by the comparator U2. U2 is gated on and off at a repetition rate of 31,250Hz. This repetition rate of 32 microseconds is generated by the 12 bit binary counter U51. Strobe pin 6 of U2 and timing capacitor C15 are gated on and off via U1 and Q2 by the pulses at TP8 and TP10. When Q2 is saturated, reducing the charge on C15 to zero, the strobe pin 6 is low. When the strobe pin 6 of U2 goes high, test point TP3 goes low. TP3 will go high again when the charge on C15 is greater than the reference voltage at pin 3, of U2. The larger the reference voltage setting between pins 2 and 3 of U2, the larger the negative pulse width at TP3.

Driver

The drain of Q3 and Q5 are out of phase with pin 7 of comparator U2. When TP3 is high, Q3 and Q5 are saturated, turning off Q4, Q6 and Q7. When TP3 is low, Q3 and Q5 are turned off, turning on Q4, charging the input capacity of Q6 and Q7.

Output

The power stage consists of two Power Mosfets, Q6 and Q7, operating as pure switches once the input capacity is charged sufficiently for drain current to flow. When Q3 and Q5 are turned off by the drive from U2, Q6 and Q7 switch on, and conduct high amperes of peak current, storing magnetic energy in the primary of T2. When Q6 and Q7 are turned off, the primary of T2 resonates with C21. The result is a damped sinusoid wave shape. The energy is coupled by secondary windings to generate output power. The damped wave shape varies with the output load. With average physiological loads, one high amplitude pulse exists with subsequent lower oscillating amplitudes.

Sound

A tone is generated when the Hyfrecator Plus is delivering power. The tone is generated by an audio transducer LS1, driven by one section of U1. The frequency of the tone is approximately 2000 Hz and is generated by a 12-bit binary counter U51. The audio level is adjustable with R25 to a level not less than 65db. A second tone is generated when the Hyfrecator Plus is delivering power and one of the Up/Down buttons is operated.

Section 4 – Service Information

Safety And Service Precautions

CAUTION: • For your safety, unplug the HYFRECATOR PLUS before you attempt to disassemble or service. When calibrating the HYFRECATOR PLUS with the power ON, please use extreme caution.

- Do not insert power cord connector into the wall socket unless the line voltage and frequency are as stated on the serial number plate.
- Ground circuit reliability can be achieved only when the Birtcher HYFRECATOR PLUS is connected to a properly grounded hospital grade wall receptacle.
- Do not operate the HYFRECATOR PLUS in the presence of flammable anesthetics. Doing so may cause injury to patient, staff, physician or damage to the unit.
- Federal law restricts operation of the HYFRECATOR PLUS to qualified physicians or other qualified practitioners.

Tools And Test Equipment

The model 7-797 HYFRECATOR PLUS requires only standard electronic tools for maintenance. The following is a list of suggested equipment for maintenance of your unit.

1. Digital Multimeter Beckman Tech 310
2. Electrosurgery Analyzer Dempsey 443
3. Leakage Meter Bio-Tek 150M
4. Oscilloscope Tektronic 5440

NOTE: Test equipment manufactured by a company other than specified may be substituted if comparable. Please call the Birtcher Medical Systems Service Department if you are unsure.

Section 5 – Suggestions For First Time Operation

Before using the HYFRECATOR PLUS clinically, we suggest the following experiment.

Hold a quarter-pound piece of room temperature beef or chicken in hand or place it on a table, and touch it with your hand to improve the path of electrical flow. Starting with a low power setting, experiment as follows:

-
- **Desiccation:** In the monoterminal without a dispersive plate mode, using an Electrolase Tip, touch the meat and turn on the current for one to five seconds. Use different intensities with the low and the high output terminals. Cut the meat open with a scalpel and view the depth of penetration. A mild blanching of the tissue is sufficient for most conditions.
 - **Fulguration:** Using either the low or high output terminals, bring the electrode near, but not touching the meat (one to three mm). Use various settings and observe the different degrees of fulguration that can be produced. Short bursts of a spark alternated with short cooling periods are most acceptable to the patient. Continuous application of the spark creates heat that may become intolerable. Cut the meat open at the fulgurated spots to view the relatively shallow effect.
 - **Coagulation:** If you have purchased the optional foot switch, non-switching handle and cord and dispersive patient plate or the forceps and footswitch, you may wish to experiment with the effects of monoterminal and bipolar coagulation. You will find that monoterminal coagulation produces very deep effects while bipolar coagulation produces relatively superficial effects.

A training tape covering basic dermatological procedures utilizing the HYFREATOR PLUS is available from your Authorized Birtcher Medical Systems Distributor (product number 7-796-21).

Section 6 – Removal And Replacement Procedures

CAUTION: For your safety, please be sure that the **HYFREATOR PLUS** is unplugged prior to performing any service.

NOTE: For all removal and replacement procedures, please refer to Drawing 16.

1. The front cover can be removed by removing the six Phillips head screws (item 18 of Main Housing Drawing 15 from the recesses on the back panel).
2. The Main Printed Circuit Board can be removed from the rear cover by removing four small Phillips head screws and four large Phillips screws from the corners of the transformer (item 9 and 12 of Main Housing Drawing 15).
3. The display board can be removed from the front cover by removing the four small Phillips head screws (item 9 of Main Housing Drawing 15).

Section 7 – Safety And Performance Checks

Safety Checks

Line Cord Continuity

1. Disconnect the power cord from the wall receptacle.
2. Connect an ohmmeter between the positive and the neutral terminal of the line cord for proper continuity.
3. If the line cord has been repaired or replaced, check to see that proper polarity has been maintained.

NOTE: Leakage tests should be conducted using a Bio-Tek 100M leakage meter, or comparable meter with similar characteristics capable of testing to AAMI specifications. Inappropriate meters can produce “**ERRONEOUS LEAKAGE**” readings. Leakage tests should be performed at a **non-conductive work station**.

WARNING: Use caution when conducting these tests. The meter must be suitably insulated and capable of withstanding the power line voltage.

Chassis Leakage

1. Push the HYFREATOR PLUS side ON/STANDBY OFF switch to ON.
2. Connect the leakage meter in series with the line cord and line power receptacle.
3. Ensure that leakage current is less than 50 microamps.
4. Open ground line and ensure leakage current is less than 50 microamps.
5. Reverse line polarity and ensure that leakage current is less than 50 microamps.
6. Turn the HYFREATOR PLUS ON/STANDBY OFF switch off. Repeat above leakage tests.

Performance Checks

1. Plug in the power cord, and switch the ON/STANDBY OFF switch to the ON position.
 - a. The LED display illuminates zero
 - b. Move Terminal Selector switch to the extreme left.
 - c. Push UP button for full scale reading.
 - d. The LED's should Display 30.
 - e. Move the Terminal selector switch to the center position.
 - f. The LED's should Display 15.
2. Attach Switching Handle and Cord Socket and Plug.
 - a. Press the DOWN button, and the display should decrease one digit at a time for approximately six counts and then decrease rapidly.
 - b. Press UP button, and the display should advance one digit at a time for approximately six counts and then advance rapidly.
 - c. Switch the ON/STANDBY OFF switch to the OFF position for ten seconds.

- d. Switch the ON/STANDBY OFF switch to the ON position and the LED display will display the last setting in item b above. (Not applicable for 7-797J)
- e. The active indicator green LED should illuminate and a tone should be audible each time the POWER ACTIVATION button is pressed.
- f. Pressing the POWER ACTIVATION button and a UP or DOWN button at the same time inhibits the UP/DOWN function, and a distinct tone is audible.

3. Test the power output in one of three ways.

- a. Follow the suggestions for first time operation, found on pages 9 and 10.
- b. Connect the electrosurgery analyzer to bipolar terminals, and check the power output correlation to the LED display.
- c. Connect a 25 Watt light bulb across the bipolar terminals, and the light bulb should illuminate at approximately three-quarters intensity.

Section 8 – Problem-Solving

NOTE: Before following any of the troubleshooting remedies outlined below, please read and follow the Removal and Replacement Procedures on page 10 and Block Diagram Figure 1.

Troubleshooting

Fault/Condition	Probable Cause	Remedy
Front Panel inoperative	Fuses F1 and F2 are blown or missing.	Replace the blown fuse(s) with the appropriate replacement; see drawing 9,10,11,15
	Power switch is faulty.	Disconnect line cord from power mains; turn power switch to the on position; check continuity of switch and primary circuit; replace defective component
	Transformer T1 is defective.	Connect line cord to power mains; turn power switch to on position; check for the following AC voltages at T1: 22 at pins 10-12, 45 at pins 7-9.
	No low voltage.	Check for DC voltage at the following

No output power, however, there is defective sound and DS51 illuminates.

Q6 and Q7.

TP: 55 at TP5, 15 at TP11, -5 at TP12, 5 at TP13, minus probe of volt meter at TP7.

Check for proper wave form at TP4. Replace Q6 and Q7.

No 55 DC volts at TP5.

Check Q1, U3, BR2 C8, for proper operation. Replace defective component.

U1, U2, Q2, Q3, Q4 or Q5 is defective.

Check for correct voltage and wave forms per block diagram and schematic. Replace defective component.

LED Display does not light.

U56, 59, 54, 55, DP51, 52, VR51, 3 and 1.

Check for +5 DC Volts at TP51; -5 DC Volts at TP53; +5 DC Volts at TP9, 11. Replace defective components.

Display reads 0, will not go up in number with the UP/DOWN Switches.

U56, 59, 54, VR3, DP51 or 52.

Check for 5 DC Volts at TP51. Check for 5 DC Volts at pin 2 of U56. Check wave forms. Replace defective components.

No sound when unit activated.

U55, 1, LS1 or R25.

Check wave form at TP55 and pin 1 U1. Replace defective component.

Section 9 – Calibration

WARNING: The electrical voltages present in the HYFREATOR PLUS are capable of causing death or injury. Please be sure to use extreme caution when servicing this equipment with the power on.

For optimum performance, you should calibrate your HYFREATOR PLUS following the replacement of any component on the display PCB or power supply PCB, or following the replacement of either PCB itself.

1. Press ON/STANDBY OFF SWITCH to the ON position.
2. LED display should display zero.

-
3. Set TERMINAL SELECTOR SWITCH to the extreme left position.
 4. Activate UP button for a display of 30.
 5. Adjust R68 for 2.5 volts \pm .1 volt at TP54.
 6. Activate DOWN button for a display of 20.
 7. At a display of 20, activate the Switching Handle, and adjust R14 for 20 Watts output into the Electrosurgery Analyzer, 500 ohm load.
 8. At a display of 5, activate the Switching Handle, and adjust R53 for 5 Watts output into the Electrosurgery Analyzer, 500 ohm load.
 9. Repeat steps 7 and 8 as necessary to achieve proper calibration.
 10. Check power output at zero display for zero output power.
 11. Adjust R25 for desired sound level.

Characteristics

1. Display Digital, no flicker.
2. Up/Down function.
 - a. Advances display in .02 increment, 0-5 range, low terminal.
 - b. Advances display in 1 increment, 5-15 range, low terminal.
 - c. Advances display in 1 increment, high and Bi-polar terminal.
 - d. Advances display from zero to full scale in 10 seconds.
3. Power Output.
 - a. Zero at Zero display.
 - b. 15 watts full scale, 500 ohm load, low terminal.
 - c. 30 watts full scale, 500 ohm load, high terminal and Bi-polar terminal
4. Activation of Handswitch or Footswitch.
 - a. Enables 2kHz audible tone.
 - b. Disables Up/Down function.
 - c. Enables Amber LED display.
 - d. Enables power output.
5. On/Standby Off.
 - a. Turns off display.
 - b. Holds Micro-controller in memory.
 - c. Disables Up/Down functions.
 - d. Disables power output.
6. UP/DOWN, Handswitch or Footswitch activated at same time.
 - a. Enables 1kHz and 2kHz audible tone mixed..
 - b. Disables power output.

Section 10 – Maintenance

The HYFREATOR PLUS requires little maintenance. To keep the instrument performing at its best, however, external cleaning should be performed on a regular basis.

NOTE: All internal service should be performed by qualified maintenance personnel only.

External Cleaning

To clean the external case of the HYFREATOR PLUS and the up/down switching handle and cord:

- Moisten a lint-free cloth with a mixture of mild soap and water.
- Clean all external surfaces with this solution.
- Dry all surfaces thoroughly using a clean, lint-free cloth.

Soap-based solutions – rather than harsh chemicals – are recommended cleaning agents for the HYFREATOR PLUS. Evaporative solutions are preferred so as to limit exposure of internal electrical components. Material characteristics of the unit do not allow for gas, steam or cold sterilization techniques.

Steam Sterilization of Accessories

NOTE: Do not autoclave the 7-796-5 power up/down switching handle and cord. If procedures require sterility, use Ethylene Oxide at <140°F.

[If a footswitch is utilized, a sterile disposable non-switching pencil and a reusable adapter can be utilized (product number 137657 for the pencil and 670-3 for the adapter). An autoclavable reusable non-switching pencil is also available (product number 7-796-6), which also requires a footswitch (product number 7-796-4).]

To steam sterilize accessories and electrodes:

- Place accessories in autoclavable packaging or wrap with a cloth.
- Autoclave at 121°C (250°F) ± 3°C for 15 minutes minimum/20 minutes maximum.
- Remove accessories from the autoclave and allow to cool for 30 minutes minimum.

NOTE: It is not advisable to cold sterilize surgical electrodes due to potential corrosion.

Section 11 – Warranty

As manufacturer of the Birtcher Medical Systems HYFRECTOR PLUS 7-797 and other high quality medical equipment, Birtcher Medical Systems warrants all of its products to be free from defects in material and workmanship under normal operation and use. The warranty period for the Birtcher Medical Systems HYFRECTOR PLUS is twelve (12) months to the product's original owner.

NOTE: The warranty card must be returned by the original owner to Birtcher Medical Systems within ten (10) days of receipt of the invoice.

A ninety (90) day warranty is provided for standard and optional accessories. The ninety (90) day warranty includes the 7-796-5 power up/down switching handle and cord. There is no warranty on disposable, single-use items.

The warranty is limited to the repair or replacement (at the manufacturer's discretion) of any HYFRECTOR PLUS (or part thereof) that is returned to the manufacturer within the specified warranty period and which, after examination, is found to be defective.

Transportation of the HYFRECTOR PLUS must be prepaid by the sender. The unit will be returned pre-paid to the owner by the same manner of transportation used in shipping the product to the manufacturer.

The warranty does not apply to any product, or integral part thereof, that has been altered or serviced by anyone other than the manufacturer. Nor does it apply toward any product that has been damaged as a result of accident, abuse, misuse or negligence on the part of the user.

Section 12 – Repair Return Policy

HYFRECTOR PLUS units and any standard or optional accessories should not be returned to the manufacturer for warranty or non-warranty repair without prior authorization. A "Return Goods Authorization" (RGA) number will be issued by Birtcher Medical Systems' repair department upon request. This number must be prominently written in the upper left hand corner of the shipping container. To receive an RGA number, please call (800) 888-1771 or (714) 753-9400.

NOTE: Any merchandise returned to Birtcher Medical Systems without a Return Goods Authorization number will not be accepted by the receiving department and will be returned to the sender.

The Birtcher Medical Systems Warranty and Return Policy for the HYFRECTOR PLUS 7-797 supersedes all other warranties either expressed or implied and shall be governed and executed under the laws for the state of California, U.S.A.

Section 13 – Specifications

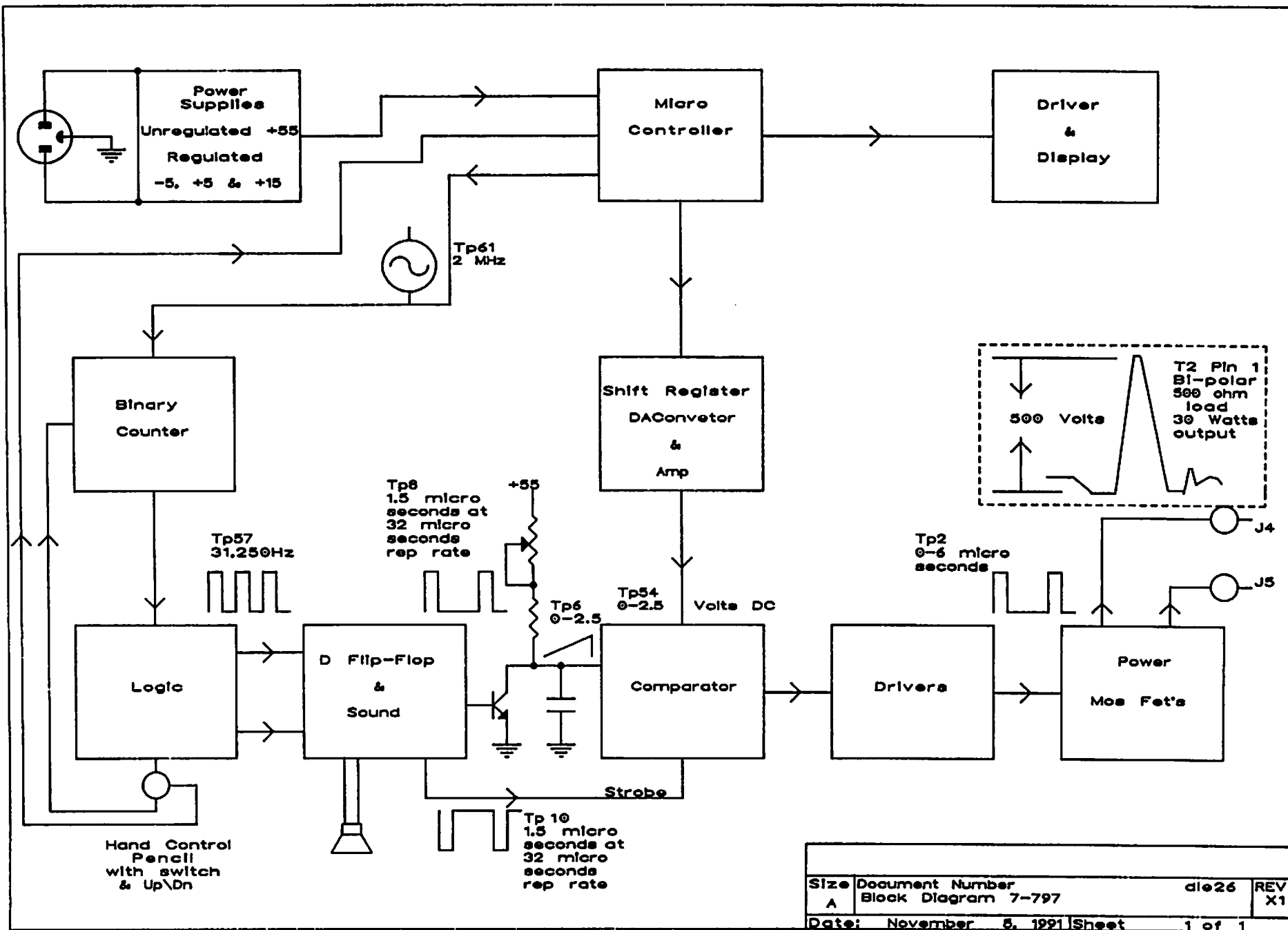
PARAMETER	CHARACTERISTICS
Environmental Conditions for Transport & Storage	
Temperature Range	-20°C to 60°C
Humidity	0% to 97%
Primary Power Requirements	
Model 7-797	120V 10% 50/60 Hz, 1 Phase;
HYFRECATOR PLUS	100V 10% 50/60 Hz, 1 Phase;
	230V 10% 50/60 Hz, 1 Phase.
Input Current	120 V-900 Milliamps max 100V-1000 Millamps max 230V-500 Milliamps max
Dimension and Weight	
Depth:	4 inches (102 mm)
Width:	8.75 inches (222 mm)
Height:	7.5 inches (190 mm)
Weight:	6 pounds (2.7 kg)
Functional Characteristics	
Output Power	
Maximum Power:	36 Watts (500 ohm load)
Bipolar:	30 ± 6 Watts (500 ohm load)
High:	30 ± 6 Watts (1000 ohm load)
Low:	15 ± 2-6 Watts (500 ohm load)
Open Circuit Voltage	
Bipolar:	3000 Vpp max.
High:	8000 Vp, 10,000 Vpp max.
Low:	4000 Vpp max.
Mode of Operation	Intermittent
Leakage:	60Hz: 50 microamps max., with third wire of line cord open.
Frequency:	500 KHz at 31.25 kHz rate.
Output Wave Shape:	Damped sinusoidal.
Output Regulation:	± 30% at 30 Watts (500 ohm load) for a ± 10% line voltage.
Duty Cycle:	10 s on, 30 s off
Audio:	1kHz and 2kHz, 65 db min.
Display Reading	
Speed 0-30:	10 seconds

Accuracy	1% at any setting
Low Range	
0-5 range:	.2 watt increments
5-15 range:	1 watt increments
Bipolar & High Terminal	1 watt increments
Approvals:	CSA, Standard C22.2, No. 125, IEC 601-1, IEC 601-2-2 Standards UL544
Risk Class:	High, Low: 2G Bipolar: 2
Protection:	CLASS I Type BF with Defibrillator Protection

Section 14 – Drawings And Schematics

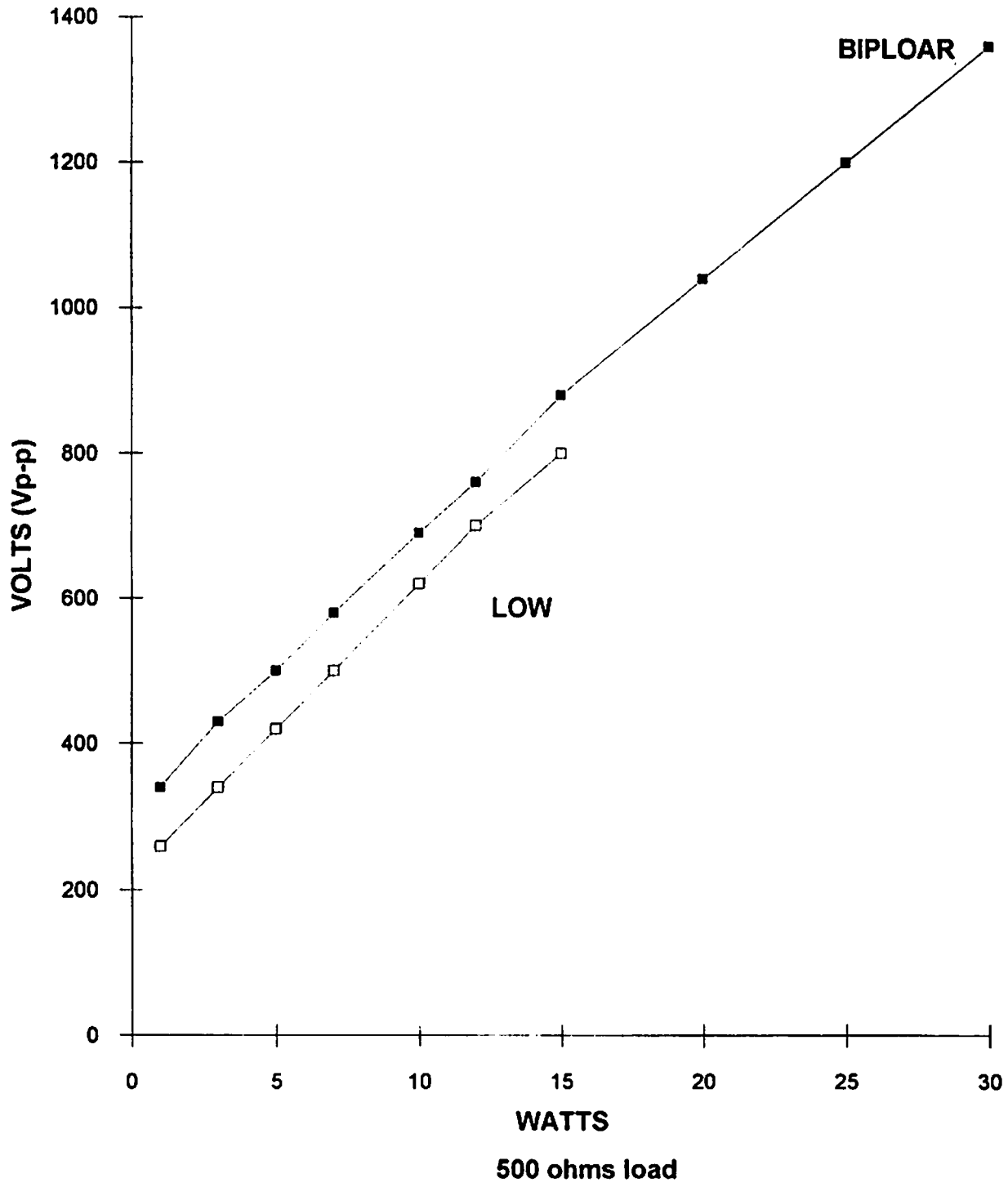
Item	Description	Page
Figure 1, 1a	Control Functions.	3, 5
Figure 2	Block Diagram.	1a
Drawing 1	Power Output - Voltage Bipolar—Low.	2a
Drawing 2	Power Output-Voltage.- High.	3a
Drawing 3	Output Power vs Display Setting Bipolar, 500 ohms Load.	4a
Drawing 4	Output Power vs Display Setting High, 1000 ohms Load.	5a
Drawing 5	Output Power vs Display Setting Low, 500 ohms Load.	6a
Drawing 6	High Load Curve.	7a
Drawing 7	Low Load Curve.	8a
Drawing 8	Bipolar Load Curve.	9a
Schematic	Motherboard.	10a, 11a
Schematic	Display.	12a
Drawing 9	Motherboard, 115, 230 Volt PCB Assembly.	13a
Drawing 10	Motherboard, Parts List.	14a
Drawing 11	Motherboard, 100 Volt PCB, Assembly.	15a
Drawing 12	Display PCB Assembly.	16a
Drawing 13	Display Parts List.	17a
Drawing 14	Display PCB Assembly.	18a
Drawing 15	Main Housing Assembly.	19a
Drawing 16	Pencil Assembly.	20a

Figure 2

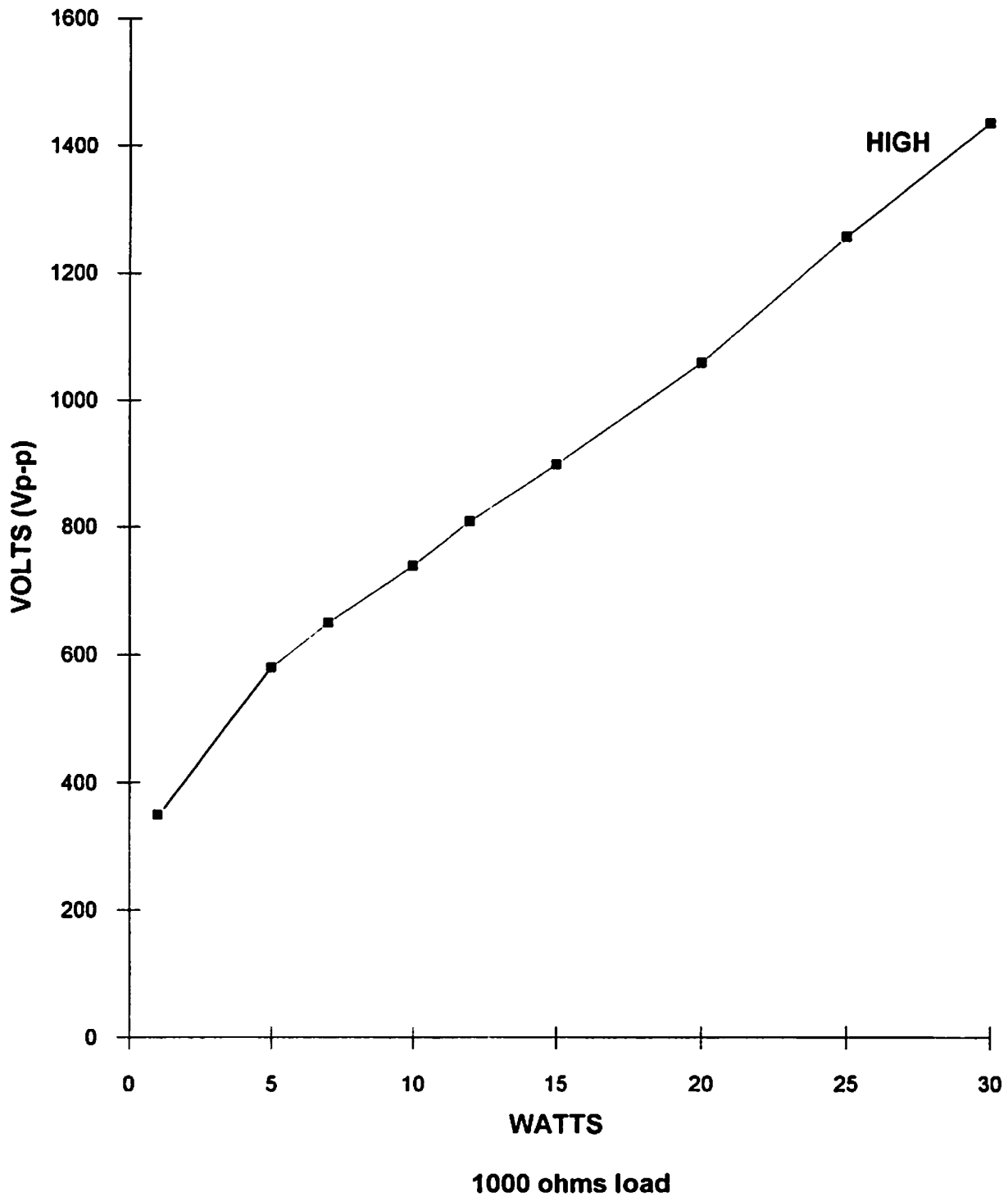


Size	Document Number	dlc26	REV
A	Block Diagram 7-797		X1
Date:	November 5, 1991	Sheet	1 of 1

POWER OUTPUT - VOLTAGE

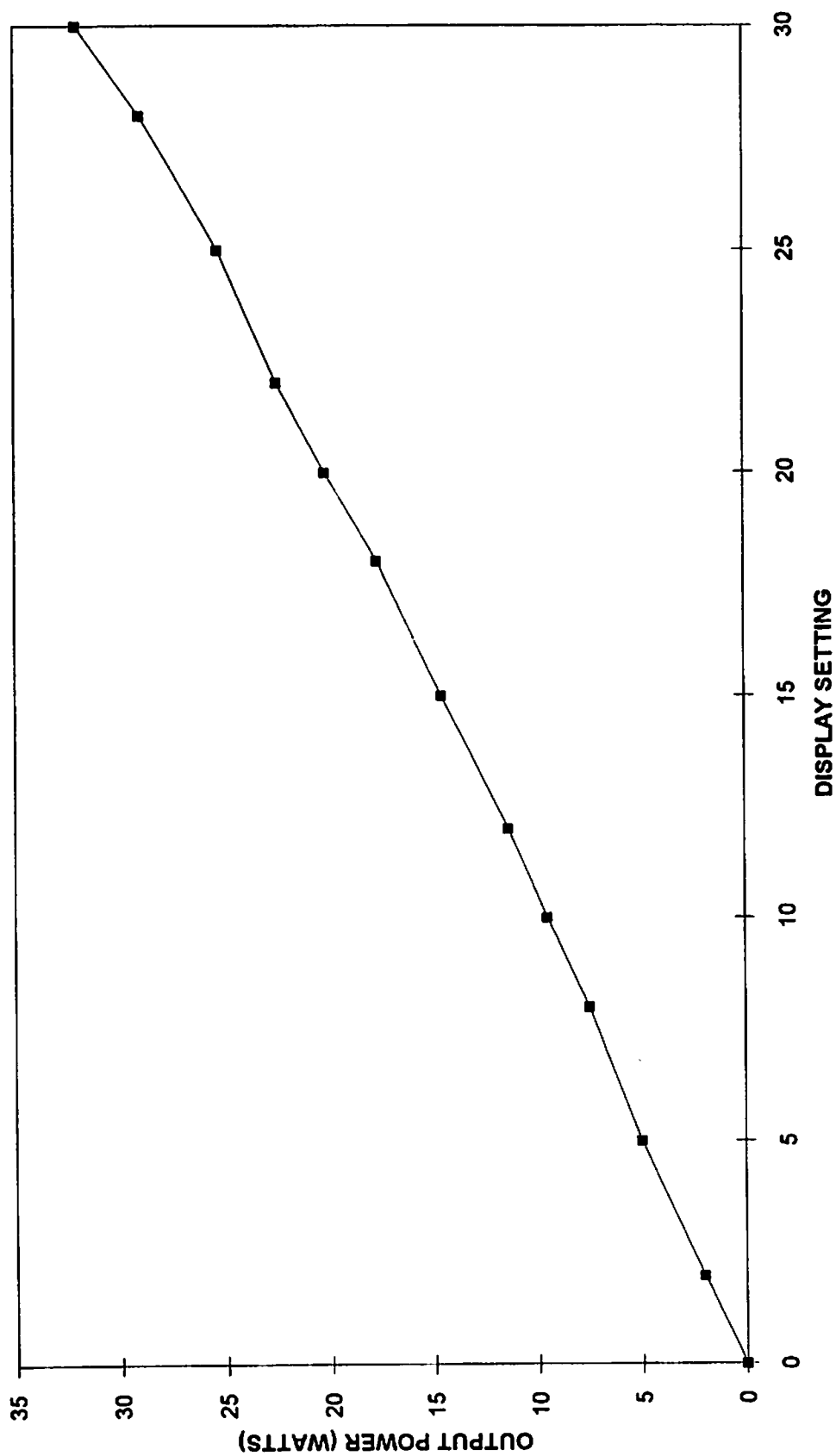


POWER OUTPUT - VOLTAGE



Output Power vs Display Setting

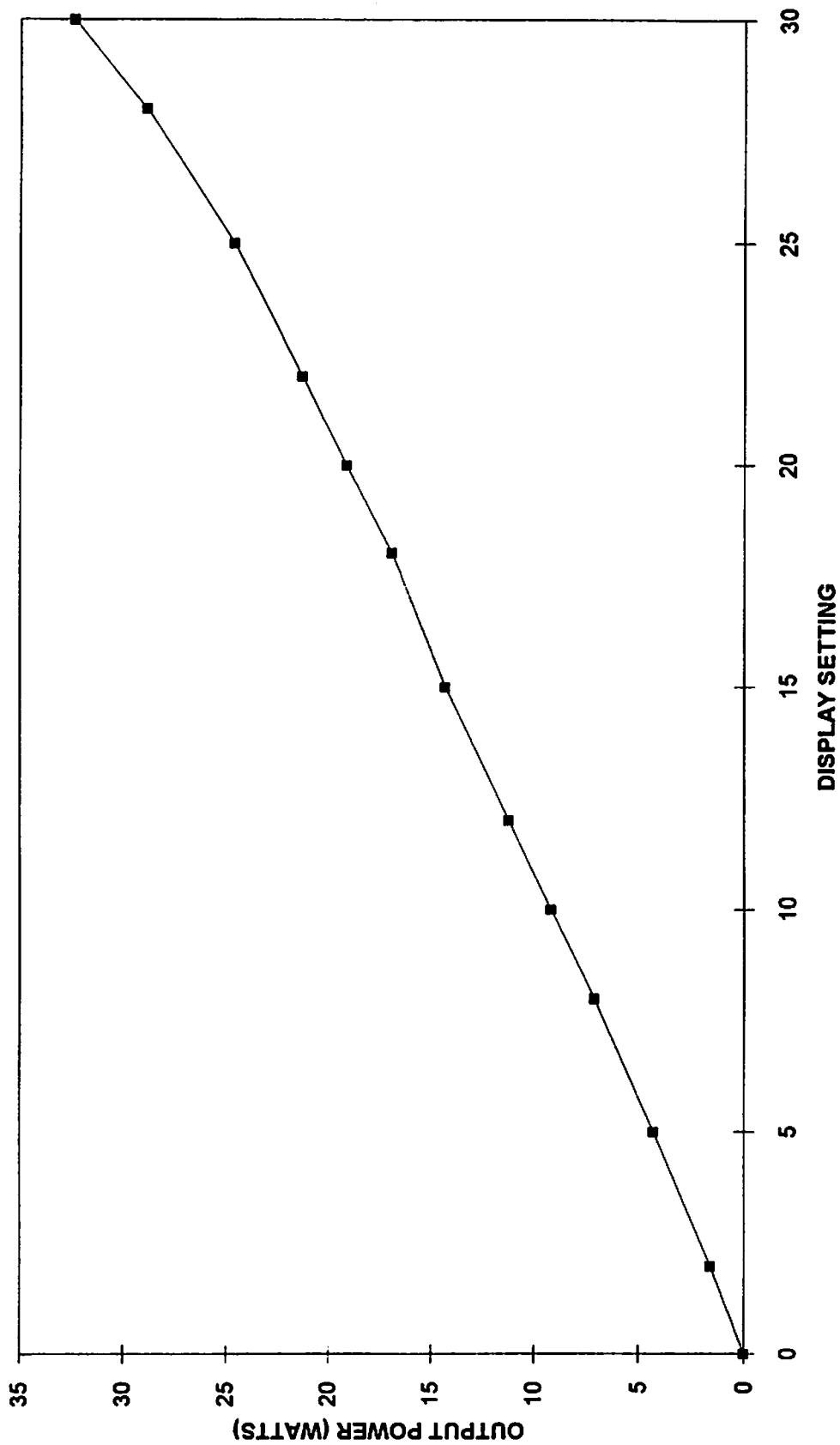
Bipolar, 500 ohms Load



Accuracy: $\pm 20\%$ of display setting or
 ± 1.5 watts into 500 ohms (whichever is greater)

Output Power vs Display Setting

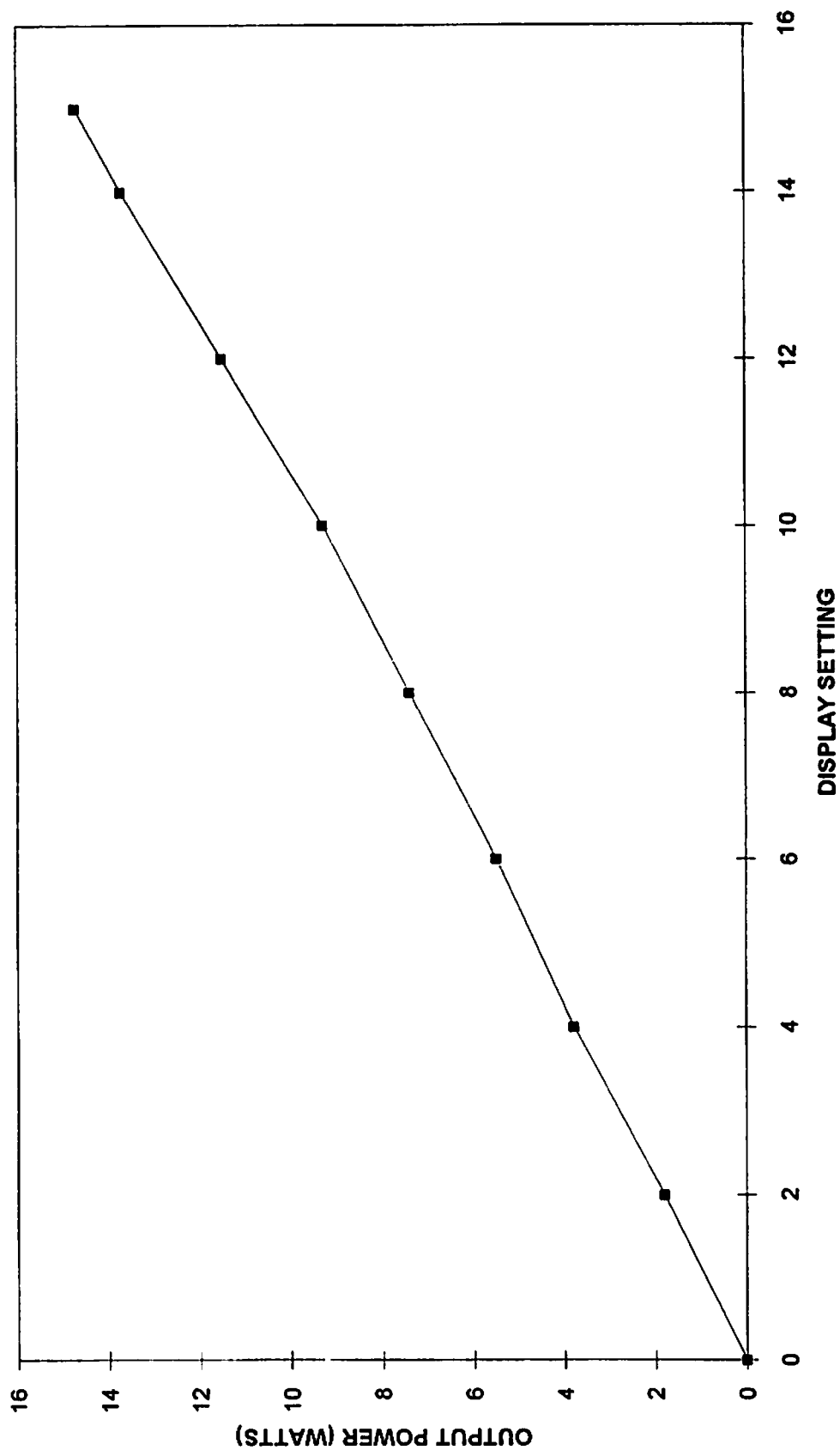
High, 1000 ohms Load



Accuracy: $\pm 20\%$ of display setting or
 ± 1.5 watts into 500 ohms (whichever is greater)

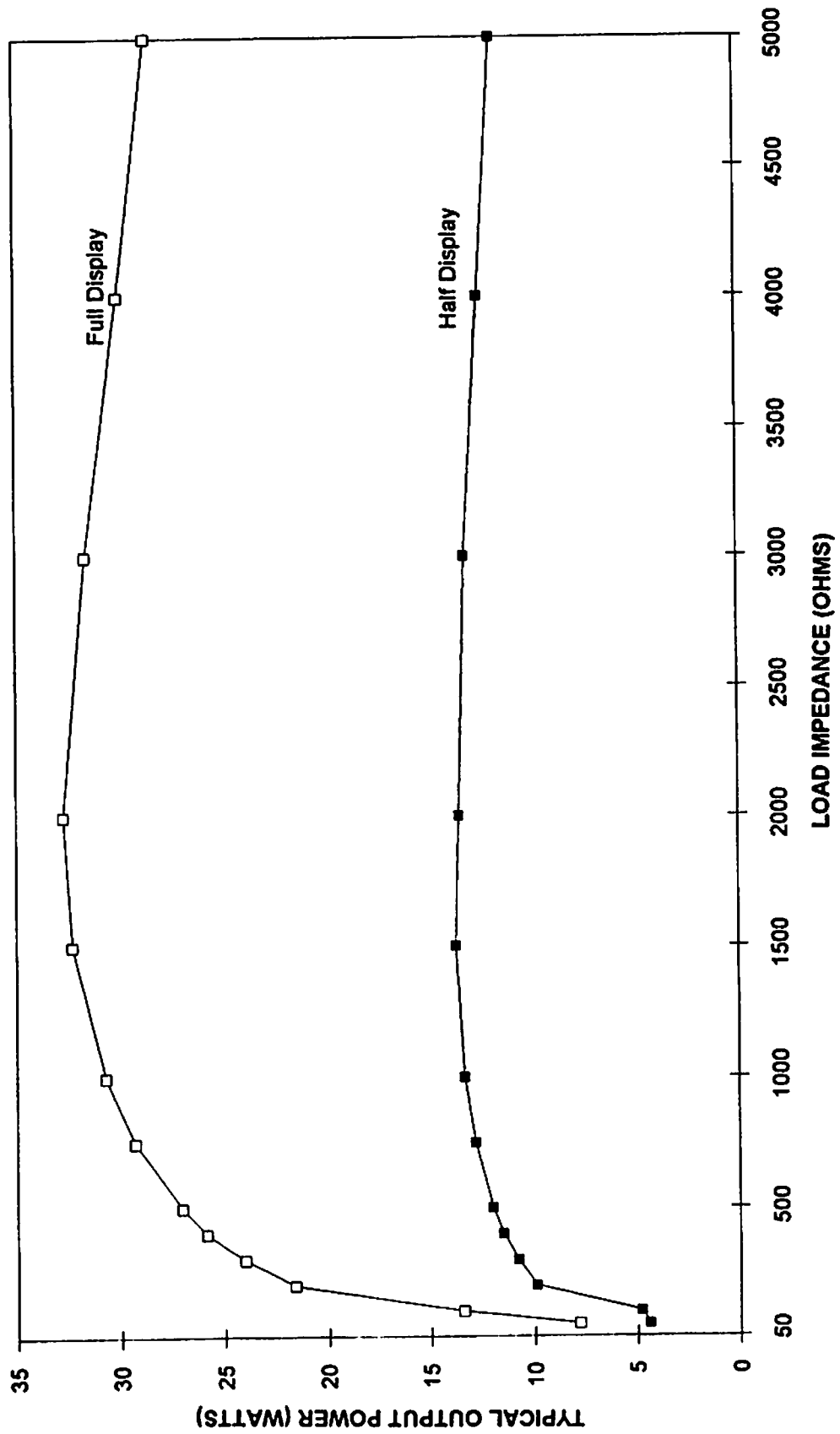
Output Power vs Display Setting

Low, 500 ohms Load

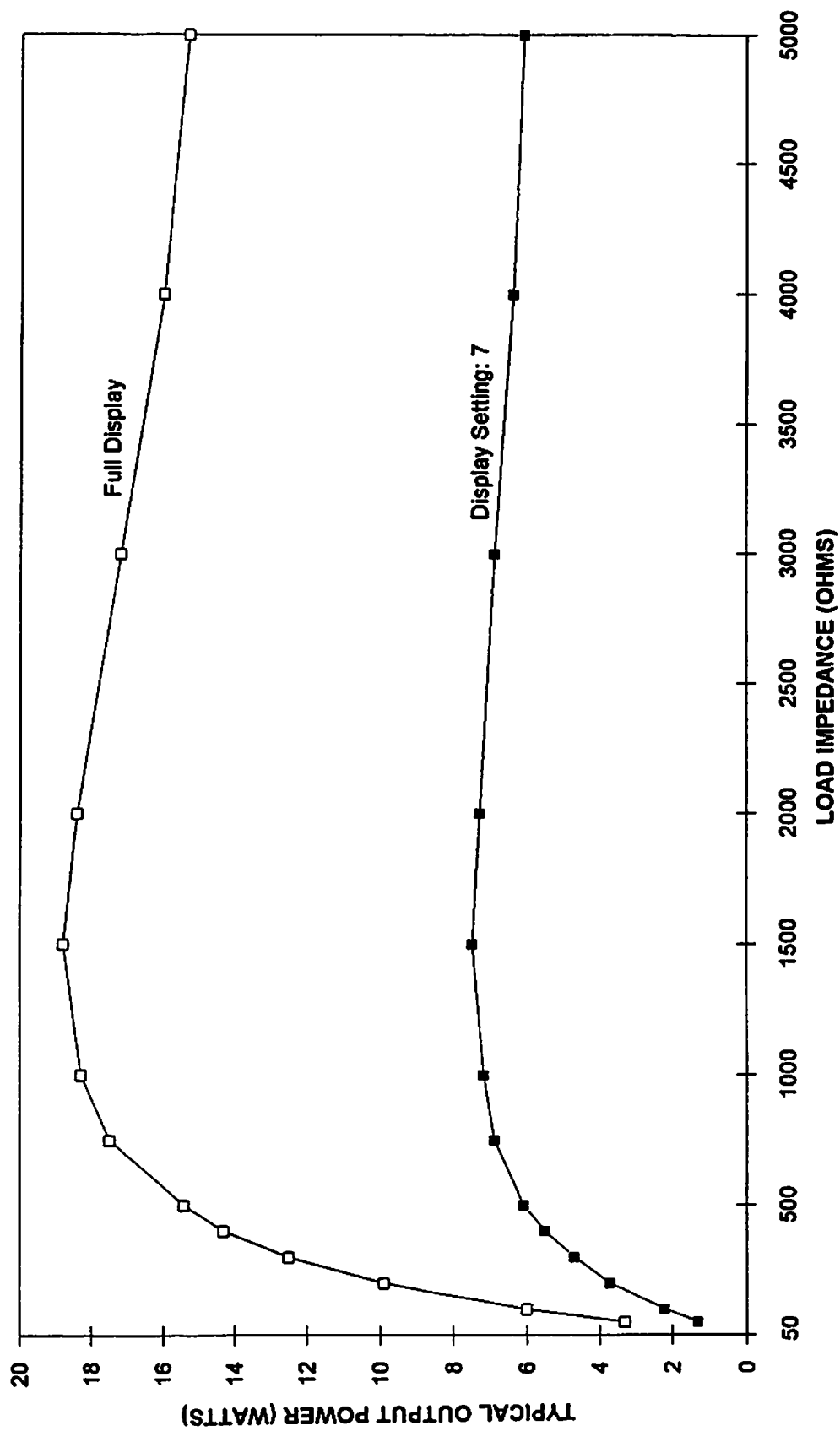


Accuracy: $\pm 20\%$ of display setting or
 ± 1.5 watts into 500 ohms (whichever is greater)

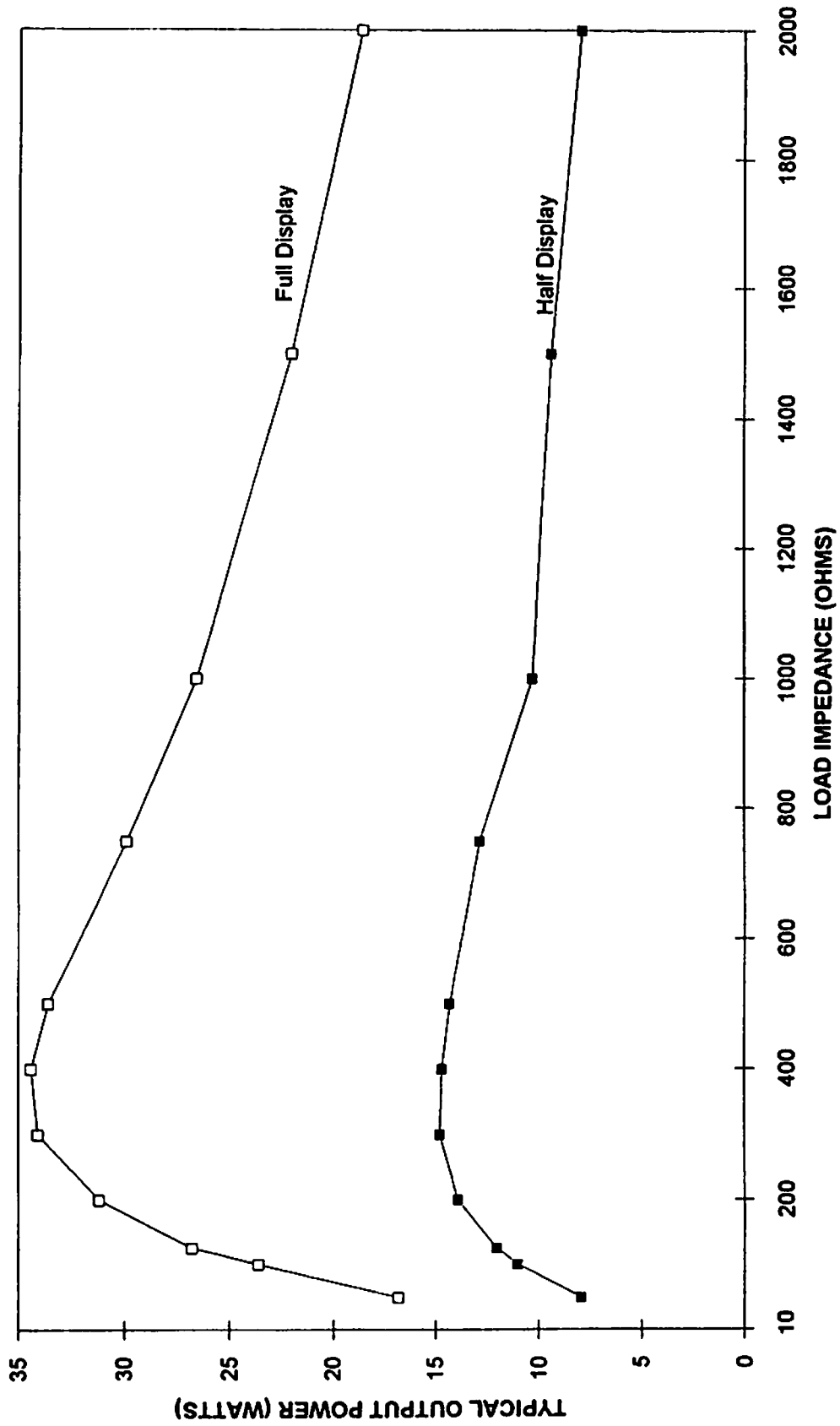
High Load Curve

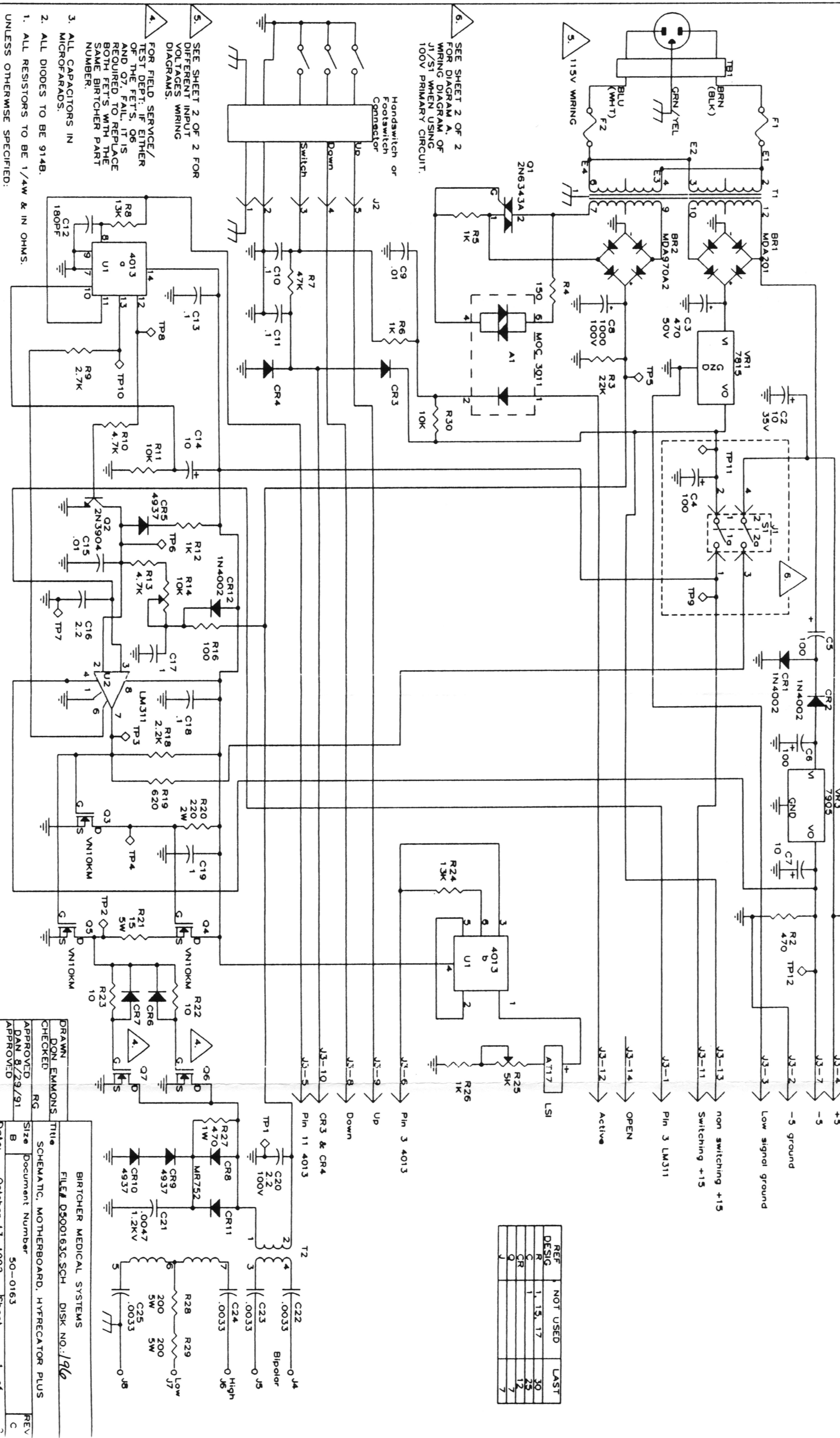


Low Load Curve



Bipolar Load Curve





REF	NOT USED	LAST
DESIG		
R	1, 15, 17	30
C	1	25
CR		12
Q		7
J		7

DRAWN DON EMMONS

CHECKED RG

APPROVED DAN 8/29/91

APPROVED

BIRCHER MEDICAL SYSTEMS

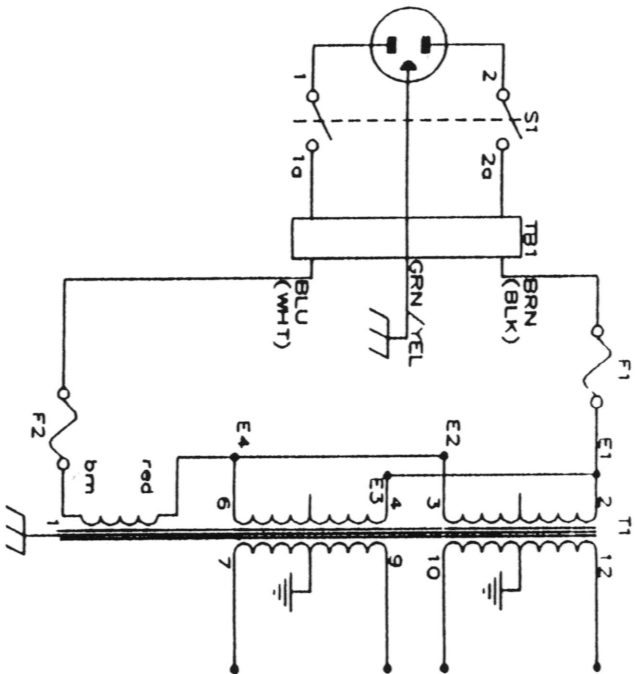
FILE# D300163C.SCH DISK NO.: 196

SCHEMATIC, MOTHERBOARD, HYPERCATOR PLUS

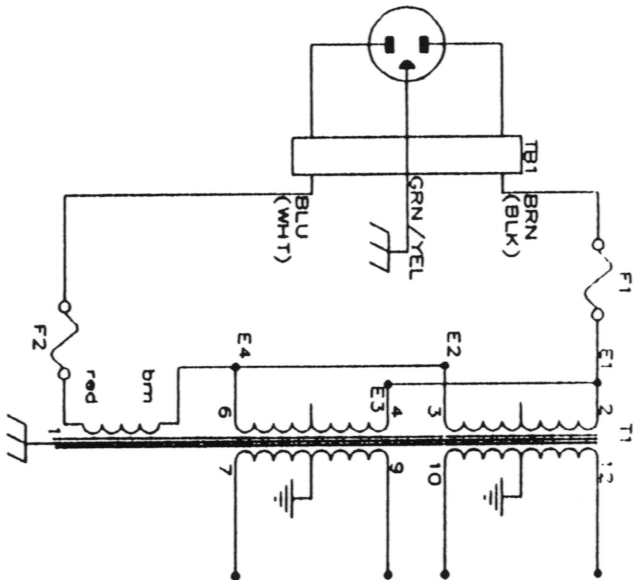
Document Number 50-0163

Date: October 13, 1992 Sheet 1 of 2

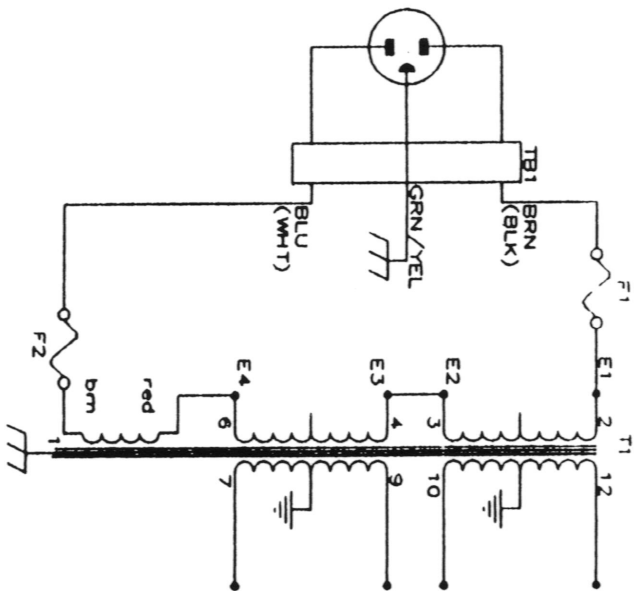
MODEL 7-797-J (JAPAN)
6, 100 Volt Wiring



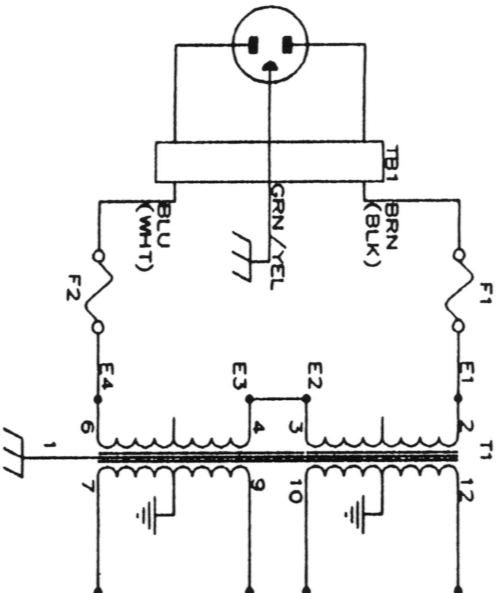
130 Volt Wiring



MODEL 7-797-A (EXPORT-215V)
215 Volt Wiring



230 Volt Wiring



245 Volt Wiring

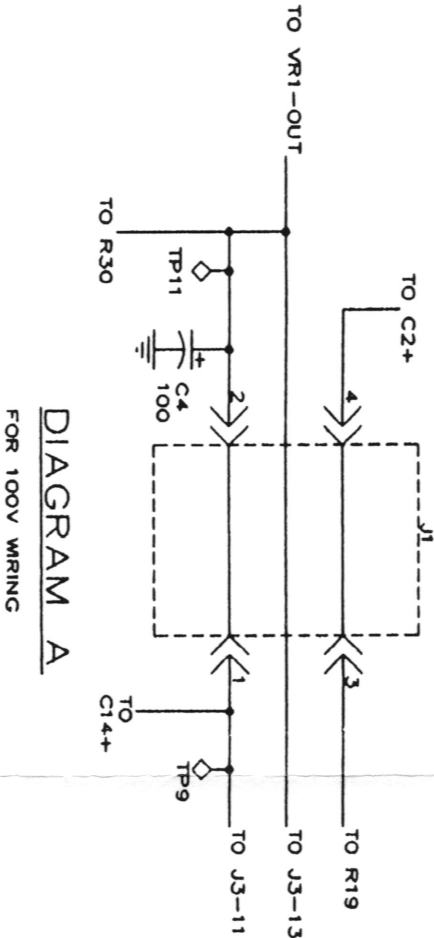
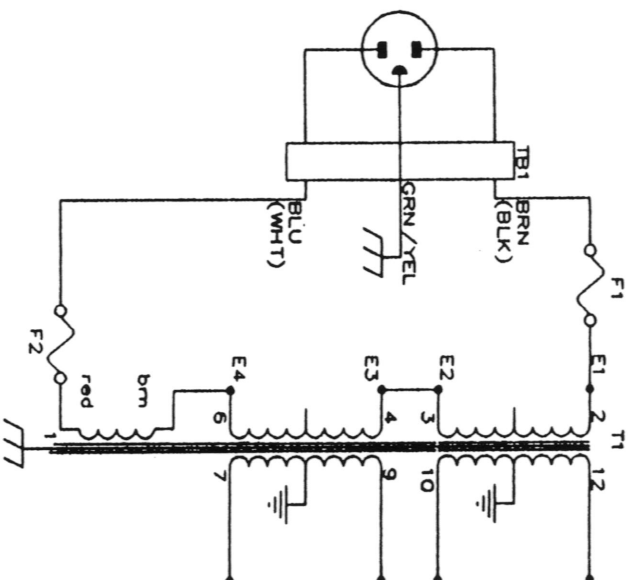
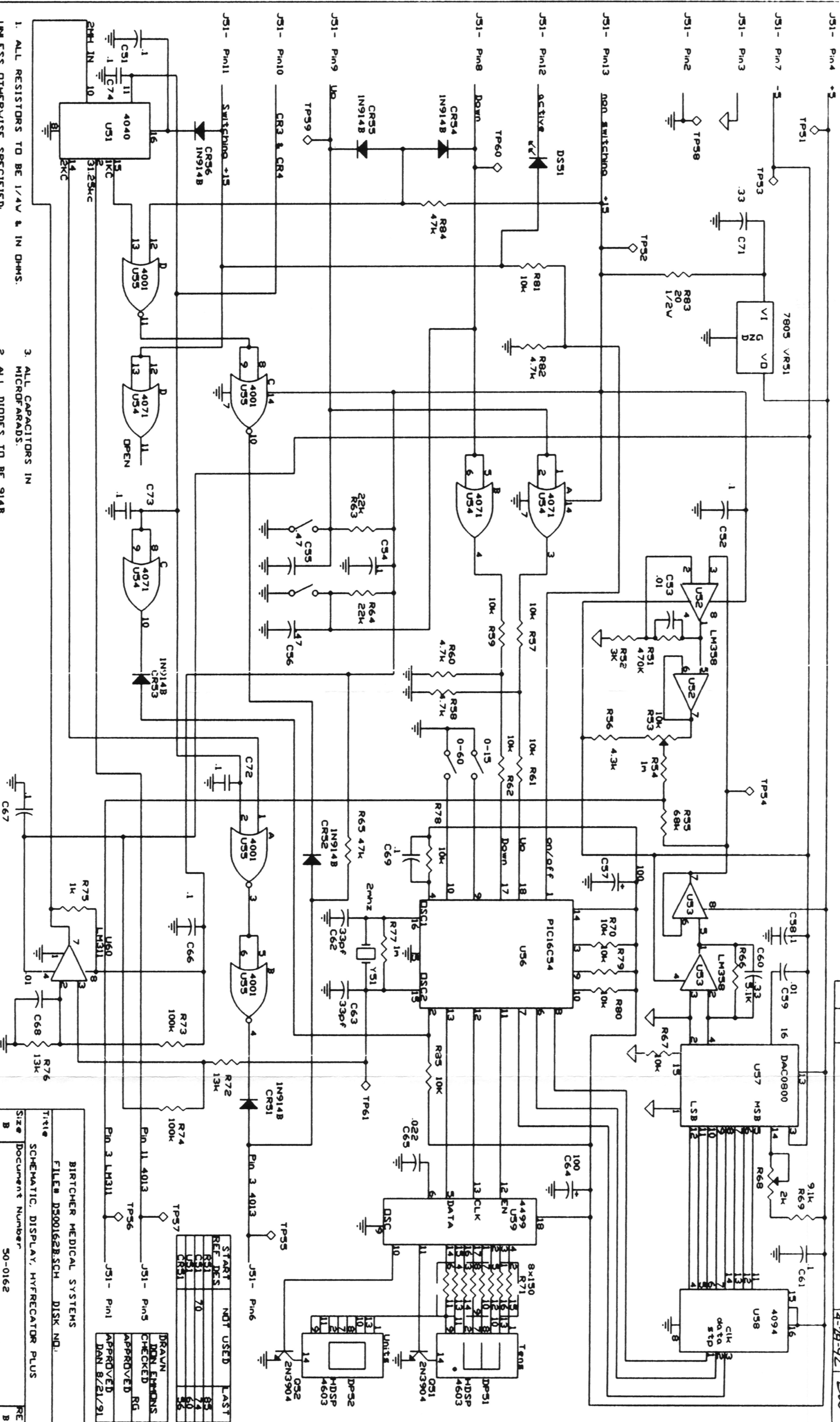


DIAGRAM A
FOR 100V WIRING

BIRCHER MEDICAL SYSTEMS			
Title			
SCHEMATIC, MOTHERBOARD, HYFREACATOR PLUS			
Size	Document Number	REV	
B	50-0163	C	
Date: September 29, 1992 Sheet 2 of 2			



1. ALL RESISTORS TO BE 1/4W & IN OHMS.

2. ALL DIODES TO BE 914B.

3. ALL CAPACITORS IN MICROFARADS.

UNLESS OTHERWISE SPECIFIED.

NOTES:

DATE: April 15, 1992 Sheet 1 of 1

12a

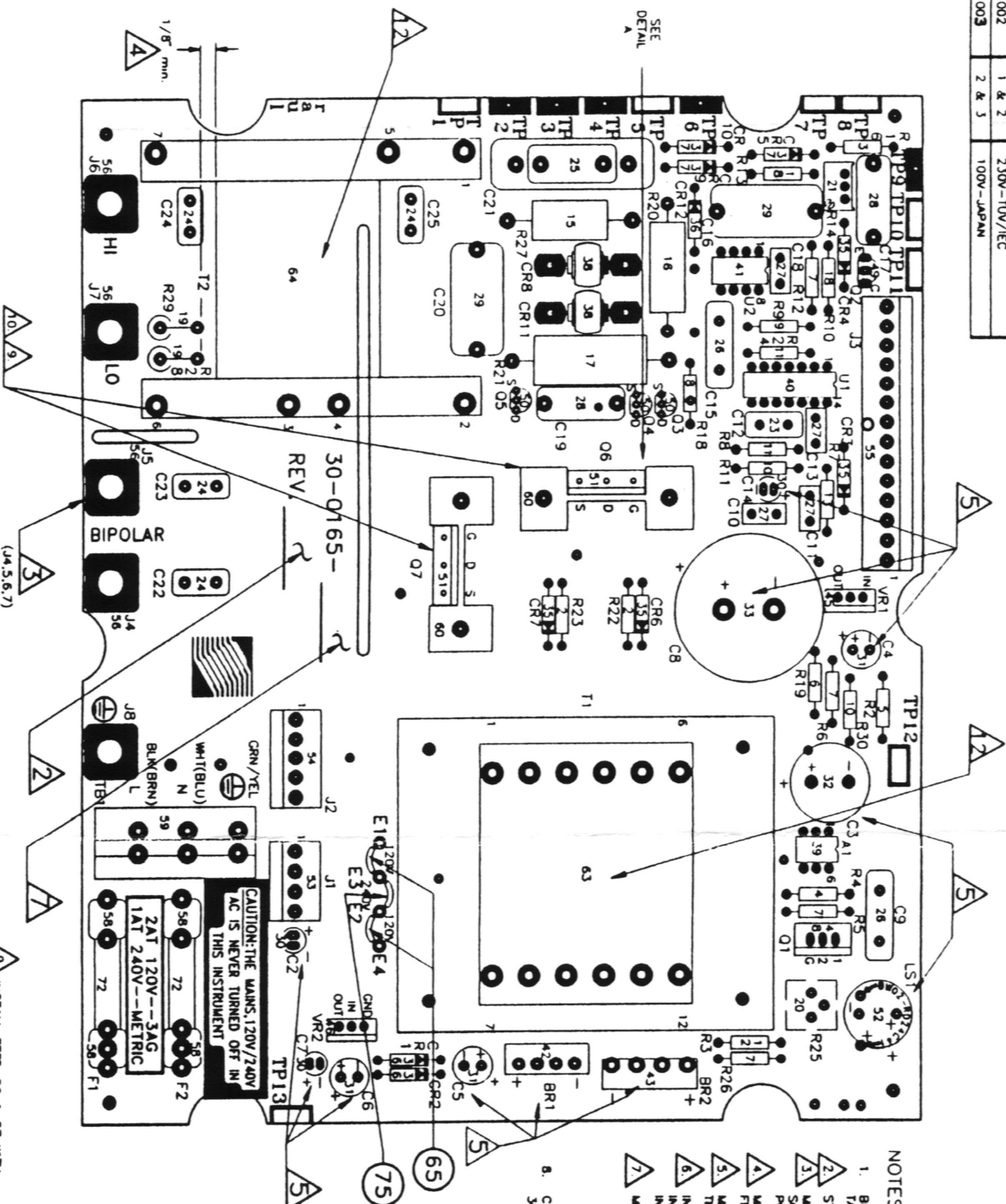
DASH	SHEETS	VOLTAGES-VERSIONS
001	1 & 2	115V-DOMESTIC (UL)/CSA
004	1 & 2	230V-EXPORT
002	1 & 2	230V-TUV/EC
003	2 & 3	100V-JAPAN

REV	ZONE	DESCRIPTION	ECO	DATE	APPROVED
E		NOTE B WAS FOR TESTING MOTHER PCB ASSY. SEE TEST PROCEDURE 70-0185-001. ADDED ITEM 72	3140	9/28/92	DW
F		DELETED SHT 4. ADDED DASH 003 FOR JAPAN 100V	3142A	10/12/92	DW

NOTES: UNLESS OTHERWISE SPECIFIED

- BEFORE ASSEMBLY, THE PRECAUTIONS WRITTEN ON T.D. 16441 SHOULD BE TAKEN. AFTER ASSEMBLY, UNIT TO BE STORED & SHIPPED IN ANTISTATIC BAG.
- STAMP REV. LETTER WITH INK ON PCB PER ASSEMBLY REVISION.
- MOUNT J4, J5, J6 & J7 USING MOUNTING FIXTURE, ITEM 70. DURING WAVE SOLDERING PROCESS, PLACE FIXTURE, ITEM 71, ON TOP OF ALL THE SINGLE POSTS TO ALIGN THEM PERPENDICULARLY TO THE PCB.
- MAKE SURE R28 & R29 WERE MOUNTED WITH A MINIMUM SPACING OF 1/8" FROM T2, AS SHOWN.
- MAKE SURE TO MOUNT C2 - C8, C14, L51, BR1 & BR2 TO THE CORRECT POLARITY.
- IN LIEU OF L51, P/N BM02-8024CA1 CAN BE USED IN LIEU OF C21, P/N BB18-472912 CAN BE USED IN LIEU OF C2, C7 & C14; P/N BB15-106X9 CAN BE USED.
- MARK DASH NO. ON THE PCB WITH INK, AS SHOWN:

ASSY P/N	DASH NO
30-0185-001	001
30-0185-002	002
30-0185-004	004
- COMPLETED MOTHER PCB ASSY MUST COMPLY WITH TEST PROCEDURE SPM 300185. CERTIFICATION REQUIRED.



CND	ZONE	REVISIONS	ECO	DATE	APPROVED
		SEE SHEET 1 OF 2			

ITEMQTY	PART NUMBER	DESCRIPTION	REF. DESIGNATOR
60	2	HEAT SINK	FOR 06 & 07
61			
62			
63	1	TRANSFORMER, POWER 120V/240V	T1
64	1	3437-7 TRANSFORMER, OUTPUT	T2
65	1"	JUMPER WIRE, make 5" long EACH	for E1/E3 & E2/E4
66	2	DI09-0406-A SCREW #4-40 X 3/8" LONG PAN HEAD	for 06 & 07
67	2	DI02-0020 NUT, HEX #4-40	for 06 & 07
68	N/R	DI03-0004 COMPOUND, HEATSINK	for 06 & 07
69			
70	REF	14083 A FIXTURE to mount J4.5,6 & 7	
71	REF	14085 A FIXTURE for J4.5,6 & 7	
72	2	SEE TAB FUSE	F1 & F2
73	1, 25"	SEE TAB WIRE INSULATED	
74			
75	5"	SEE TAB JUMPER WIRE	

TABULATION					
ITEM	REQ'D	PART No	REQ'D	PART No	REQ'D
53	1	BU05-0097	1	BU05-0097	N/A
56	4	BS02-0009	4	BS02-0017	4
63	1	05-0153-001	1	BR05-0008	1
65	1"	HA01-0006		N/A	1"
72	2	BS04-0700A5D	2	BS04-0100CSA	2
73		N/A		N/A	1, 25"
75		N/A	5"	HA01-0006	5"

DRWING

RAVH

DECEDED

APPROVED

REVISIONS

SEE SHEET 1 OF 2

ECO

DATE

APPROVED

ALL DIM IN INCHES

XX & .005

XX & .01

XX & .1

DISK NO.: A192

FILE NO.: D30816SF

SCALE

INCH

DO NOT SCALE

DRWING

SIZE

DRG NO.

C

30-0165F

REV

MOTHER PCB PARTS LIST

HYFREACATOR (7-797)

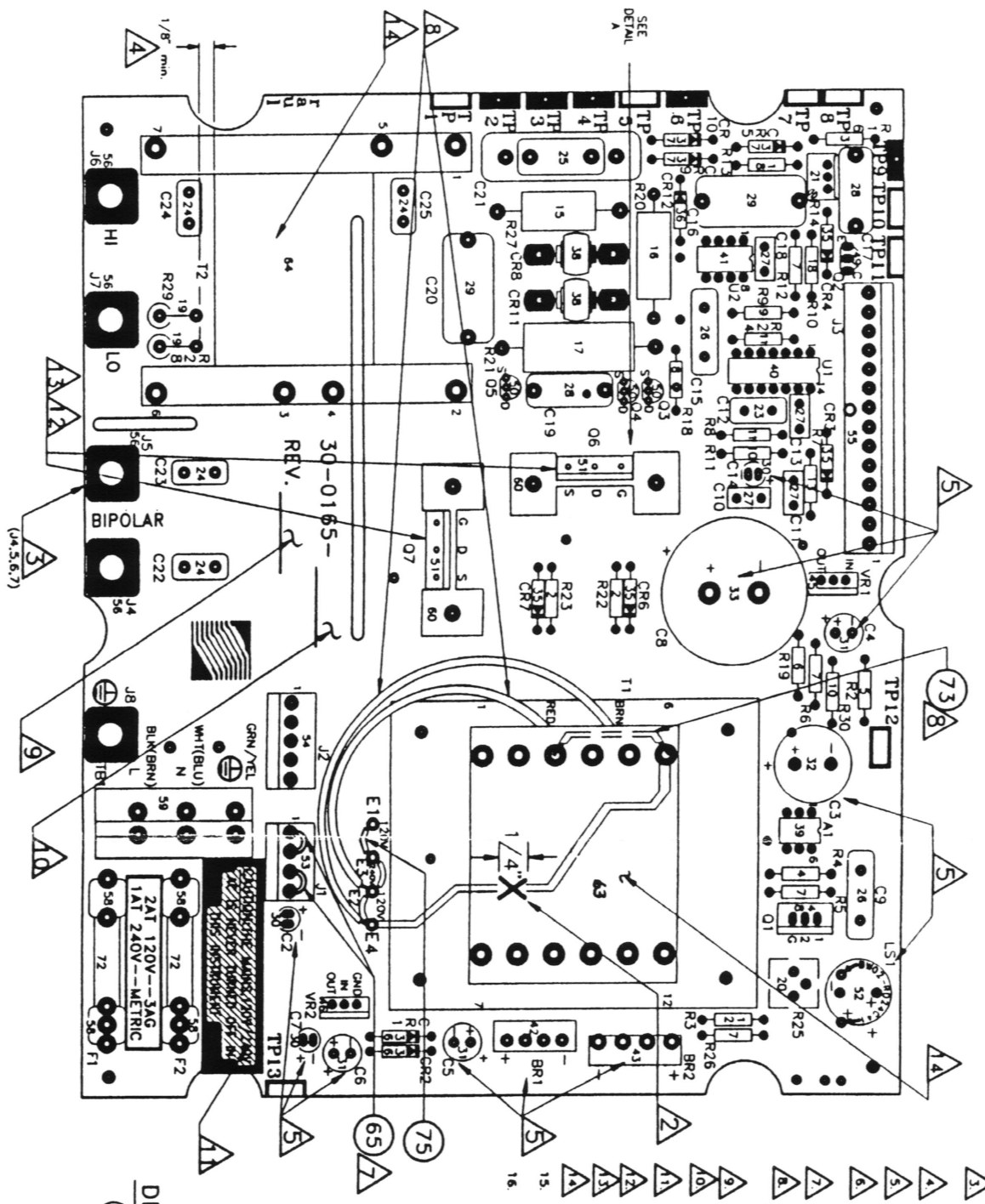
ITEMQTY	PART NUMBER	DESCRIPTION	REF. DESIGNATOR
1	1	06-0165-001 P.C. BOARD REV "B"	
2	2	01-0166-100 RESISTOR, 10Ω 1/4W 5% CARBON	R22,23
3	1	01-0166-101 RESISTOR, 100Ω 1/4W 5% CARBON	R16
4	1	01-0166-151 RESISTOR, 150Ω 1/4W 5% CARBON	R4
5	1	01-0166-471 RESISTOR, 470Ω 1/4W 5% CARBON	R2
6	1	01-0166-621 RESISTOR, 620Ω 1/4W 5% CARBON	R19
7	4	01-0166-102 RESISTOR, 1KΩ 1/4W 5% CARBON	R5,6,12,26
8	1	01-0166-222 RESISTOR, 2.2KΩ 1/4W 5% CARBON	R18
9	1	01-0166-272 RESISTOR, 2.7KΩ 1/4W 5% CARBON	R9
10	2	01-0166-103 RESISTOR, 10KΩ 1/4W 5% CARBON	R11,30
11	2	01-0166-133 RESISTOR, 13KΩ 1/4W 5% CARBON	R8,24
12	1	01-0166-223 RESISTOR, 22KΩ 1/4W 5% CARBON	R3
13	1	01-0166-473 RESISTOR, 47KΩ 1/4W 5% CARBON	R7
14			
15	1	BI14-471J RESISTOR, 470Ω 1W 5% CARBON	R27
16	1	BI15-221J RESISTOR, 220Ω 2W 5% CARBON	R20
17	1	01-0654-150 RESISTOR, 15Ω 3W 10% CARBON DISC	R21
18	2	01-0166-472 RESISTOR, 47KΩ 1/4W 5% CARBON	R10,13
19	2	BI24-201J RESISTOR, 200Ω 3W 5% CARBON	R28,29
20	1	BI17-502T640 POTENTIOMETER, 5K 1T	R25
21	1	BI18-103W POTENTIOMETER, 10K 25T	R14
22			
23	1	01-0655-181 CAPACITOR, 180 pF 500V DIPPED MICA	C12
24	4	BB21-332J CAPACITOR, 0.033 μF 3KV CERAMIC DISC	C22,23,24,25
25	1	BB21-472W A CAPACITOR, 0.047 μF 12KV CERAMIC DISC	C21
26	2	BB16-1039 CAPACITOR, 01 μF 100V POLYESTER	C9,15
27	4	BB19-104K CAPACITOR, 1 μF 63V MULTILAYER FILM	C10,11,13,18
28	2	BB27-105K CAPACITOR, 1 μF 100V METALLIZED FILM	C17,19
29	2	BB27-225K CAPACITOR, 2.2 μF 100V METALLIZED FILM	C16,20
30	3	BB23-106M A CAPACITOR, 10 μF 35V ALUMINUM ELECTROLYTIC	C2,7,14
31	3	BB23-107M CAPACITOR, 100 μF 35V ALUMINUM ELECTROLYTIC	C4,5,6
32	1	BB23-477M50 CAPACITOR, 470 μF 50V ALUMINUM ELECTROLYTIC	C3
33	1	BB23-108M CAPACITOR, 1000 μF 100V ALUMINUM ELECTROLYTIC	C8
34			
35	4	BL02-9148 DIODE, 1N9148	CR3,4,6,7
36	3	BL02-4002 DIODE, 1N4002	CR1,2,12
37	3	BL02-4937 DIODE, 1N4937	CR3,9,10
38	2	BL02-752 DIODE, M752	CR8,11
39	1	BL14-3011 I.C. MOC3011 6L	A1
40	1	BL15-4013BE I.C. 4013 14L (010290000)	U1
41	1	BL10-311N I.C. LM311N 8L	U2
42	1	BL02-MDA201 BRIDGE RECTIFIER, MDA201	BR1
43	1	BL02-MDA970A2 BRIDGE RECTIFIER, MDA970A2	BR2
44			
45	1	BL16-7815C VOLTAGE REGULATOR +15V 7815C	VR1
46	1	BL16-7905CT VOLTAGE REGULATOR -5V 7905CT	VR2
47			
48	1	BL06-6343A TRANSISTOR, 2N6343A	Q1
49	1	BL06-3904 TRANSISTOR, 2N3904	Q2
50	3	MS326-0010 TRANSISTOR, 2N1010M	Q3,4,5
51	2	01-0661-001 TRANSISTOR, FET	Q6,7
52	1	BM02-A1-17 A BUZZER, A1-17	LS1
53	1	SEE TAB CONNECTOR, 156 CENTER 4 PIN	J1
54	1	BU05-0098 CONNECTOR, 156 CENTER 5 PIN	J2
55	1	02-0380-014 CONNECTOR, 156 CENTER 14 PIN	J3
56	4	24466-29 POST, SINGLE	J4,5,6,7
57			
58	4	SEE TAB FUSE CLIP	for F1 & F2
59	1	DE02-0021 TERMINAL BLOCK	TB1

4

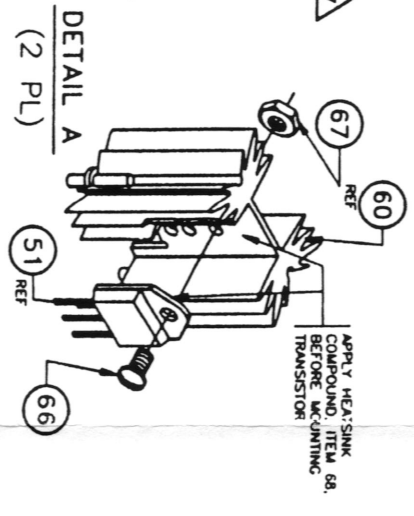
3

2

1

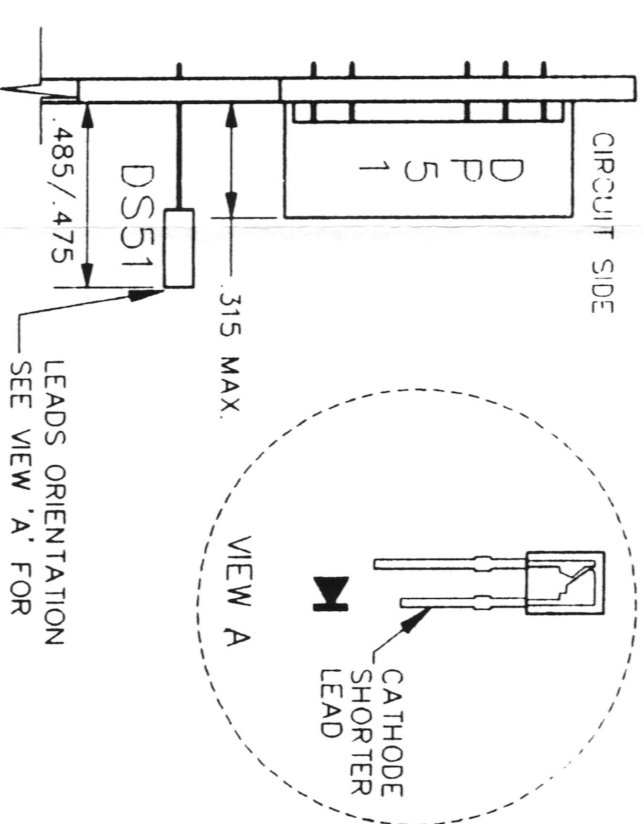
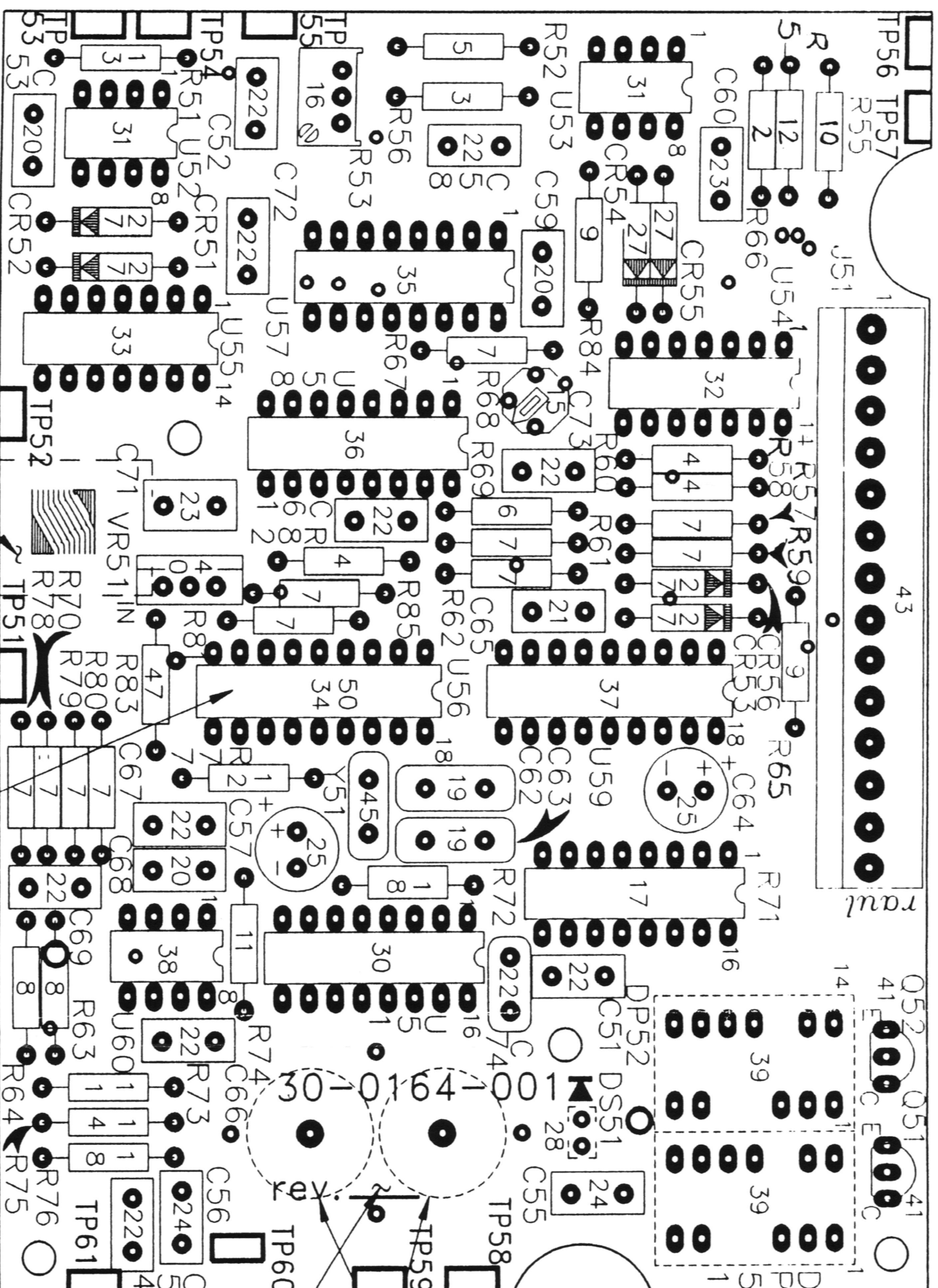


- NOTES: UNLESS OTHERWISE SPECIFIED
1. BEFORE ASSEMBLY, THE PRECAUTIONS WRITTEN ON I.D. 16441 SHOULD BE TAKEN. AFTER ASSEMBLY, UNIT TO BE STORED & SHIPPED IN ANTISTATIC BAG.
 2. BEFORE ASSEMBLY, MODIFY BARE PCB, ITEM 1, BY CUTTING A 1/4\"/>
 3. MOUNT J4, J5, J6 & J7 USING MOUNTING FIXTURE, ITEM 70. DURING WAVE SOLDERING PROCESS, PLACE FIXTURE, ITEM 71, ON TOP OF ALL THE SINGLE POSTS TO ALIGN THEM PERPENDICULARLY TO THE PCB.
 4. MAKE SURE R28 & R29 WERE MOUNTED WITH A MINIMUM SPACING OF 1/8\"/>
 5. MAKE SURE TO MOUNT C2 - C8, C14, L51, BR1 & BR2 TO THE CORRECT POLARITY.
 6. IN LCU OF L51, P/N BW02-R024C41 CAN BE USED.
 7. IN LCU OF C21, P/N BB18-472912 CAN BE USED.
 8. IN LCU OF C2, C7 & C14; P/N BB15-106X9 CAN BE USED.
 9. DO NOT INSTALL J1, ITEM 53, INSTEAD SOLDER JUMPER WIRES, ITEM 63, FROM PIN 1 TO PIN 2 AND FROM PIN 3 TO PIN 4.
 10. AFTER T1 IS ASSEMBLED, SOLDER BRN WIRE OF T1 TO E4 & RED WIRE TO E2. ALSO SOLDER WIRE, ITEM 73, FROM T1-PIN 6 TO T1-PIN3 ON CIRCUIT SIDE OF PCB, AS SHOWN.
 11. STAMP REV. LETTER WITH INK ON PCB PER ASSEMBLY REVISION.
 12. MARK DASH NO. "003" ON THE PCB WITH INK, AS SHOWN.
 13. BLACKEN THE STATEMENT "CAUTION: THE MAINS INSTRUMENT", ON THE PCB WITH INK, AS SHOWN.
 14. INSTALL FETS, 06 & 07 WITH SAME BIRCHER PAINT NO. 5.
 15. FOR FIELD SERVICE/TEST DEPTS. IF EITHER OF THE FETS 06 & 07 FAIL, IT IS REQUIRED TO REPLACE BOTH FETS WITH THE SAME BIRCHER PAINT NO. 5.
 16. MAKE SURE THE POWER & OUTPUT TRANSFORMERS, T1 & T2 (ITEMS 63 & 64) ARE MOUNTED FLUSH TO THE PCB.
 17. COMPLETED MOTHER PCB ASSY MUST COMPLY WITH TEST PROCEDURE SPM 300165, CERTIFICATION REQUIRED.
 18. ASSEMBLY TO MEET OR EXCEED BMS WORKMANSHIP STANDARD, CWS00001.



DRAWING		BIRCHER MEDICAL SYSTEMS	
DESIGNED	APPROVED	TH15	MOTHER PCB ASSEMBLY
APPROVED	APPROVED	HYFRECATOR (100V-JAPAN)	
ALL DIM IN INCHES		DSK. NO.: 192	SIZE
UNSPECIFIED TOLERANCES ARE AS SHOWN		PLF. NO.: 0300165F	DWG. NO.
X2 & 1"		SCALE 1:3X	DO NOT SCALE
ANGLES 3° ±			SHEET 3 OF 3


REV.	ECO	DESCRIPTION	DATE	APPROVED
A	2944A	UNCONDITIONAL ENG. RELEASE ITEM 4 WAS 06-0166-472	2/6/92	D.W.
B	3140	REVISED NOTE 5, ADDED NOTES 6, 7, 8 & SHT 3, ADDED ITEM 31, 24466-28 ADDED ITEM 52, 24466-30	9/28/92	D.W.



8. COMPLETED DISPLAY PCB ASSY MUST COMPLY WITH TEST PROCEDURE SPM 300164. CERTIFICATION REQ'D.
7. DON'T TOUCH THE DOMES AND THE TWO PADS AS SHOWN ON VIEW "C" (SEE SHT 3). MAKE SURE THESE AREAS ARE FREE OF CONTAMINANTS, LIKE OIL, SWEAT, DIRT, ETC. BEFORE MOUNTING THE DOME STRIP WIPE PADS WITH GENESOLV.
6. INSERT BUTTON (ITEM 51) IN HOLES IN P.C.B. (SEE SHEET 3)
5. DOME STRIP (ITEM 52) HAS TO BE CENTERED TO THE PADS AS SHOWN ON VIEW "C". (SEE SHT 3). IF DOME STRIP IS NOT AVAILABLE P/N 24466-33 CAN BE USED PER TRIMMING INSTRUCTION SHOWN ON ECO 4576-4, SHT 2 OF 4.


NOTES: CONTINUED

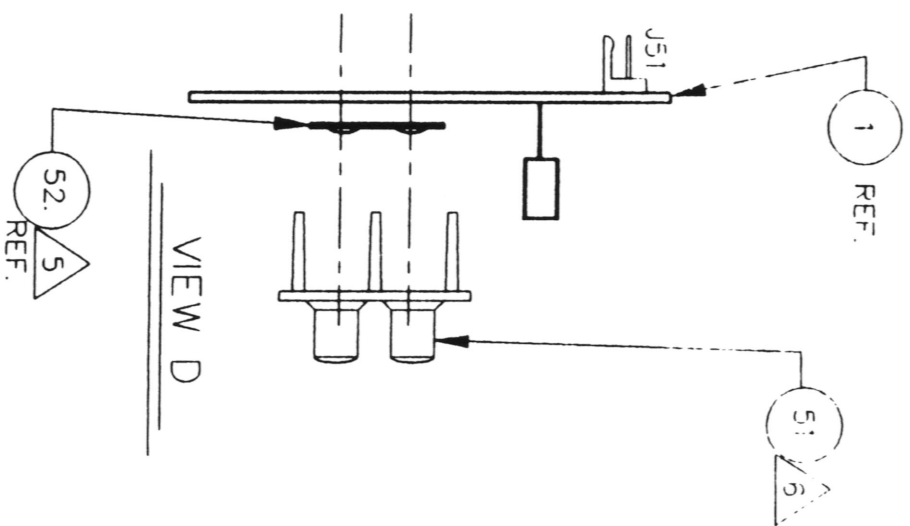
DRAWN	8-13-91		
CHECKED			
DAN W.	8-19-91		
APPROVED			
DON E.	8-23-91		
APPROVED			
DAN W.	8-19-91		
ALL DIM IN INCHES			
UNSPECIFIED TOLERANCES			
.XXX ± .005			
.XX ± .01			
.X ± .1			
ANGLES ± 1°			

		BIRCHER MEDICAL SYSTEMS 50 Technology Drive Irvine, California 92718	
TITLE		PCB ASSEMBLY HYFREACATOR DISPLAY	
DISK NO.:	A194	SIZE	DWG NO.
FILE NO.:	D300164B	B	30-0164
SCALE	2X	DO NOT SCALE DRAWING	SHEET 1 OF 3

ITEM QTY		PART NUMBER	DESCRIPTION	REFERENCE DES.
1	1	06-0164-001	DISPLAY P.C. BOARD	
2	1	01-0166-512	RESISTOR 5.1K Ω 1/4W 5% CARBON	R66
3	1	01-0166-432	RESISTOR 4.3K Ω 1/4W 5% CARBON	R56
4	3	01-0166-472	RESISTOR 4.7K Ω 1/4W 5% CARBON	R58,60,82
5	1	01-0166-302	RESISTOR 3K Ω 1/4W 5% CARBON	R52
6	1	01-0166-912	RESISTOR 9.1K Ω 1/4W 5% CARBON	R69
7	11	01-0166-103	RESISTOR 10K Ω 1/4W 5% CARBON	R57,59,61,62,67,70,78-81,85
8	2	01-0166-223	RESISTOR 22K Ω 1/4W 5% CARBON	R63,64
9	2	01-0166-473	RESISTOR 47K Ω 1/4W 5% CARBON	R65,84
10	1	01-0166-683	RESISTOR 68K Ω 1/4W 5% CARBON	R55
11	2	01-0166-104	RESISTOR 100K Ω 1/4W 5% CARBON	R73,74
12	2	01-0166-105	RESISTOR 1M Ω 1/4W 5% CARBON	R54,77
13	1	01-0166-474	RESISTOR 470K Ω 1/4W 5% CARBON	R51
14	1	01-0166-102	RESISTOR 1K Ω 1/4W 5% CARBON	R75
15	1	BI31-202M	POT 2K Ω 1T	R68
16	1	BI18-103W	POT 10K Ω 25T	R53
17	1	01-0656-001	RESISTOR NETWORK 150 Ω DIP 16L	R71
18	2	N5345-2134	RESISTOR 13K Ω 1/4W 5% CARBON	R72,76
19	2	BB14-330J	CAP 33PF 500V	C62,63
20	3	BB19-103K	CAP .01 μ F 63V	C53,59,68
21	1	BB19-223K	CAP .022 μ F 63V	C65
22	11	BB19-104K	CAP .1 μ F 63V	C51,52,54,58,61,66,67,69,72,73,74
23	2	BB19-334K	CAP .33 μ F 63V	C60,71
24	2	BB19-474K	CAP .47 μ F 63V	C55,56
25	2	BB23-107M	CAP 100 μ F 35V	C57,64
26				
27	6	01-0029-000	DIODE IN914B	CR51 to CR56
28	1	BL02-PY4504K	LED GREEN	DS51
29				
30	1	01-0230-000	I.C. 4040 16L	U51
31	2	BL10-358N	I.C. LM358N 8L	U52,53
32	1	01-0198-000	I.C. CD4071B 14L	U54
33	1	01-0200-000	I.C. CD4001BFX 14L	U55
34	1	20-0181-001	EPROM, PROGRAMMED, 7-797	U56
35	1	01-0657-001	I.C. DAC0800LCN 16L	U57
36	1	BL15-4094BCN	I.C. CD4094BCN 16L	U58
37	1	01-0651-001	I.C. 4499 18L	U59

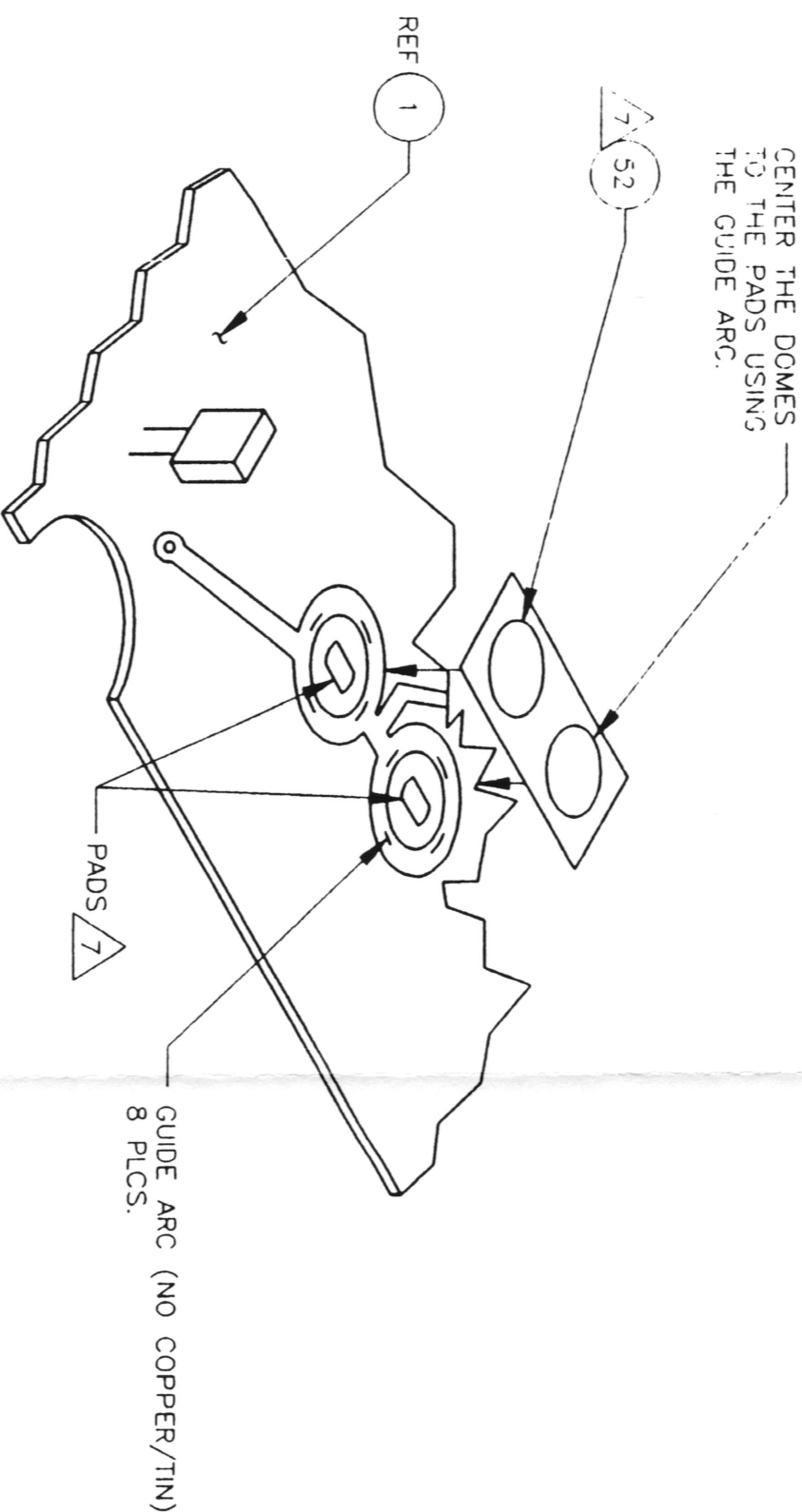
REV	ECO	DESCRIPTION	DATE	APPROVED
SEE SHEET 1				
ITEM	QTY	PART NUMBER	DESCRIPTION	REFERENCE DES.
38	1	BL10-311N	I.C. LM311N 8L	U60
39	2	01-0652-001	LED DISPLAY HDSP4603 14L	DP51,52
40	1	BL16-7805CT	VOLTAGE REGULATOR 7805CT	VR51
41	2	01-0152-000	TRANSISTOR 2N3904	Q51,52
42				
43	1	02-0390-014	CONNECTOR .156 C-C 14 PIN	J51
44				
45	1	01-0653-020	RESONATOR, CERAMIC 2MHz	Y51
46				
47	1	BI13-200J	RESISTOR 20 Ω 1/2W 5% CARBON	R83
48	A/R	JA04-0029	RUBBER SEAL, PCB	
49				
50	1	02-0391-018	SOCKET, DIP, 180 HIGH, 18 POS	DS56
51	1	24466-28	BUTTON	
52	1	24466-30	DOME STRIP (2 DOMES)	
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				

DRAWN <i>MP</i> 8-13-91				50 Technology Drive Irvine, California 92718	
CHECKED	APPROVED	TITLE			
APPROVED		PARTS LIST			
APPROVED		DISPLAY PCB ASSY			
ALL DIM IN INCHES		DISK NO.: 194		SIZE	DWG NO.
UNSPECIFIED TOLERANCES		FILE NO.: D300164B		B	30-0164
.XXX \pm .005		SCALE		NONE	DO NOT SCALE DRAWING
.XX \pm .01		SHEET		2	OF 3
.X \pm .1		REV		B	
ANGLES \pm 1°					



1. REF.

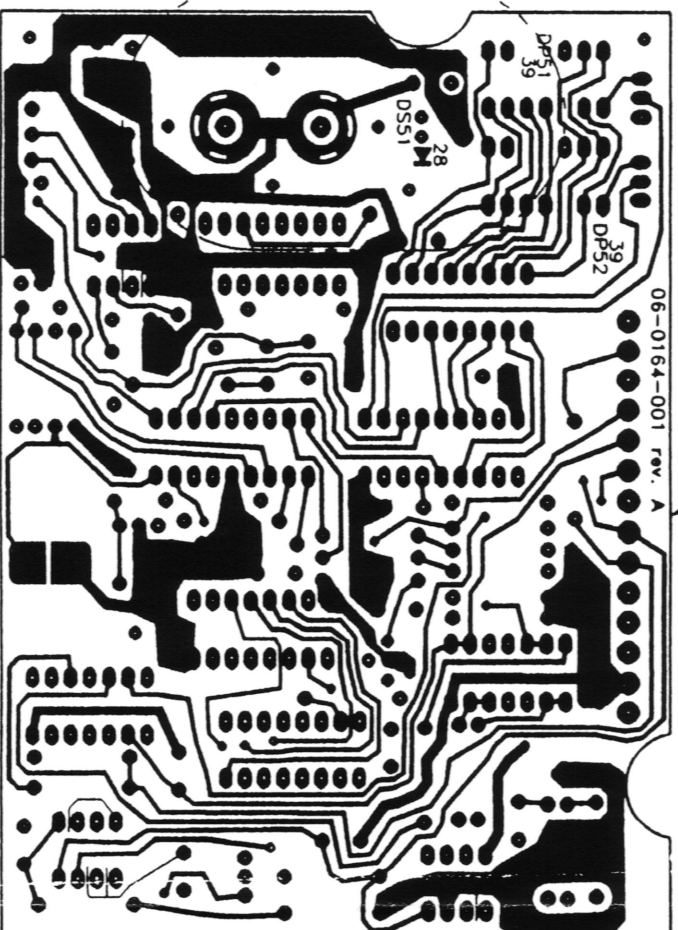
5 VIEW C
CIRCUIT SIDE



SEE VIEW C

D

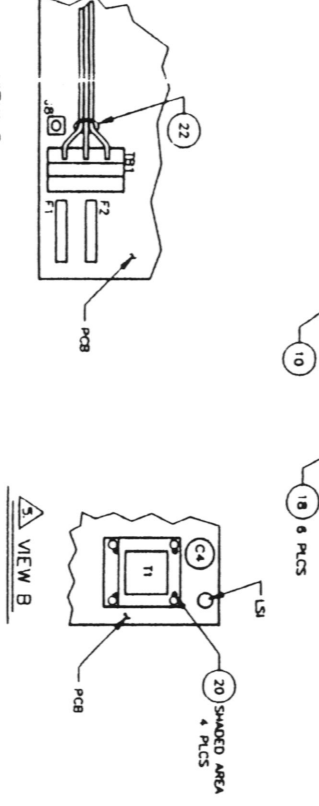
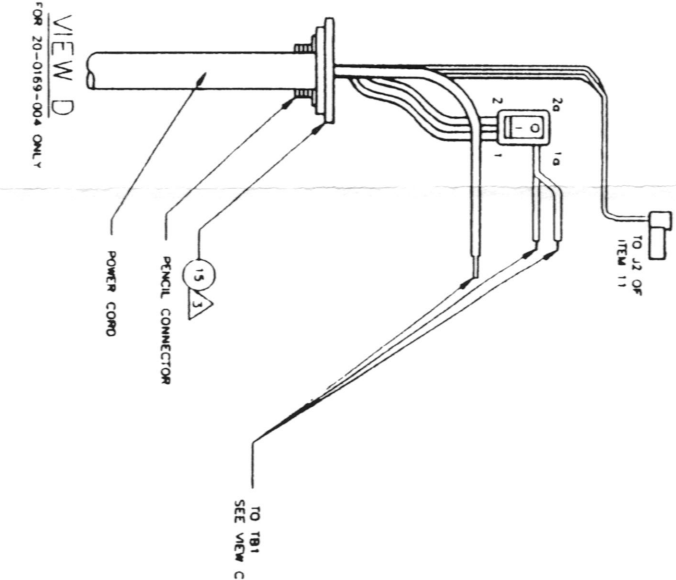
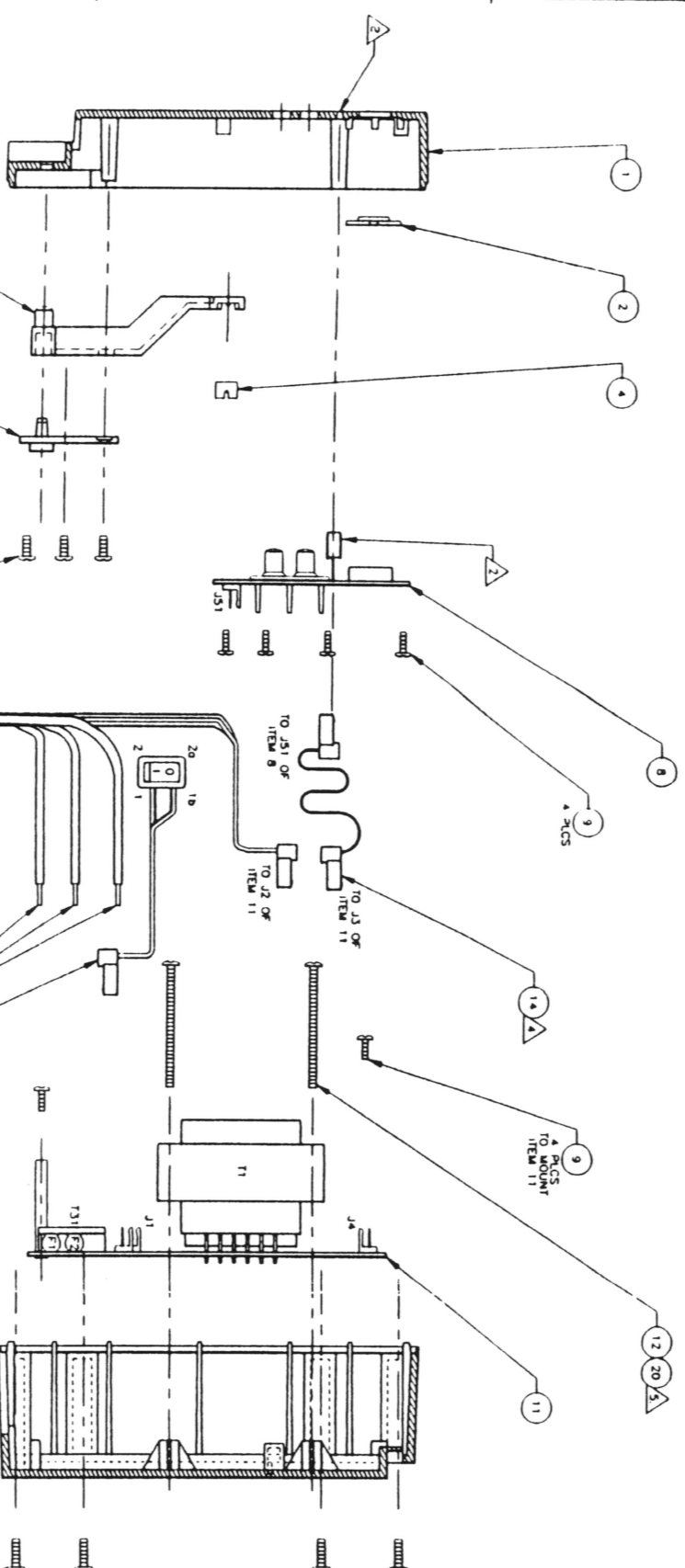
CIRCUIT SIDE SHOWN



DRAWN	9/8/92	BIRTCHE MEDICAL SYSTEMS				50 Technology Drive
CHECKED		Irvine, California 92718				
APPROVED		TITLE				
APPROVED		PCB ASSEMBLY				
APPROVED		HYFRECACTOR DISPLAY				
ALL DIM IN INCHES		DISK NO.: 192	SIZE	DWG NO.	REV	
UNSPECIFIED TOLERANCES		FILE NO.: D308164B	B	30-0164	B	
XXX ± .005		SCALE	NONE	DO NOT SCALE DRAWING	SHEET	3 OF 3
XX ± .01						
X ± .1						
ANGLES ± 1°						

DASH NO
SEE TAB

REV	DATE	APPROVED
1	10/14/92	OW
2	7/29/92	OW
3	9/28/92	OW
4	10/21/92	OW



VIEW B

VIEW C

TABULATION BLOCK

ITEM	REV	FOR JAPAN (00V)	FOR UL (115V)	FOR CSA (115V)	FOR TOV/IEC (230V)	FOR EXP (230V)
1	1	20-0165-003	30-0165-001	30-0165-001	30-0165-002	30-0165-004
2	1	20-0166-004	3437-8	3437-5	3437-9	3437-8
3	1					
4	1					
5	1					
6	1					
7	1					
8	1					
9	1					
10	1					
11	1					
12	1					
13	1					
14	1					
15	1					
16	1					

MAIN HOUSING ASSY. 7-797

ITEM	REV	PART NO.	DESCRIPTION
1	1	24466-11	SLIDE PLATE RETAINER
2	1	24466-10	SWITCH CONTACT
3	1	24466-9	SWITCH SLIDE PLATE
4	1	24466-8	LED WINDOW
5	1	07-0372-001	FRONT COVER, 7-797, SILKSCREENED
6	1		
7	1		
8	1		
9	1		
10	1		
11	1		
12	1		
13	1		
14	1		
15	1		
16	1		
17	1		
18	1		
19	1		
20	1		
21	1		
22	1		

- 1. SCREWS (ITEM 12), HAVE TO BE TORQUED FOR 50 IN/OZ. THEN APPLY QAPTD. (IN LCU OF QAPTD. USE JAPAN P/N 0A01-0025). SEE VIEW B. THE TWO SCREWS (UPPER) CLOSE TO C4 AND C5 TO BE MOUNTED FIRST BEFORE MOUNTING THE OTHER TWO SCREWS.
- 2. FAN FOLD CABLE ASSEMBLY (ITEM 14), BEFORE MOUNTING, AS SHOWN, CABLE NOT TO TOUCH HEATSINK ON MAIN BOARD, ITEM 11.
- 3. SLIDE CONNECTOR PLATE ASSY. (ITEM 13) IN THE REAR HOUSING (ITEM 10) SO THAT THE POWER CORD WOULD BE IN THE RIGHT HAND SIDE OF THE PENCIL CONNECTOR.
- 4. BEFORE MOUNTING THE PCB (ITEM 8), MAKE SURE THE YELLOW LED IS STRAIGHTENED-UP. LED HAS TO BE INSERTED IN THE HOLE WITHOUT BENDING THE LEADS.

NOTES (UNLESS OTHERWISE SPECIFIED)

